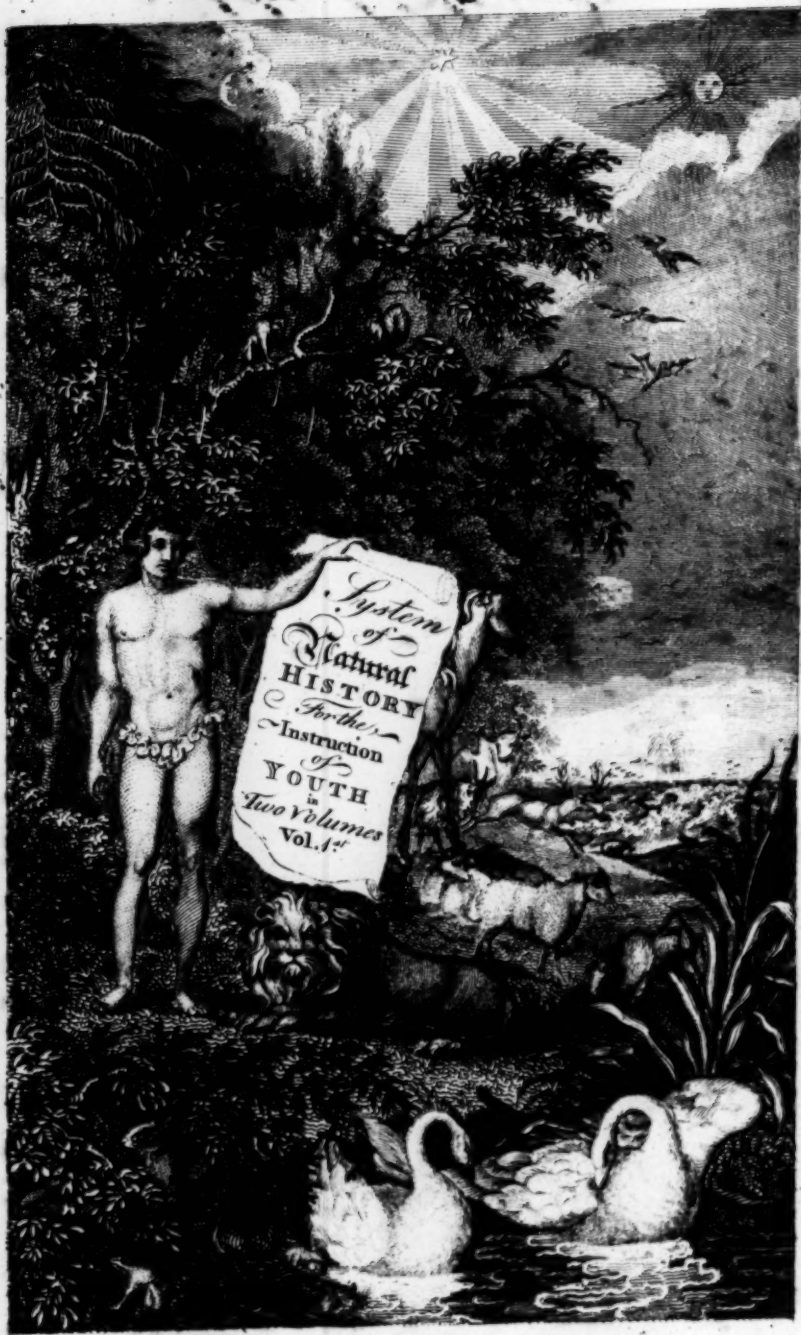
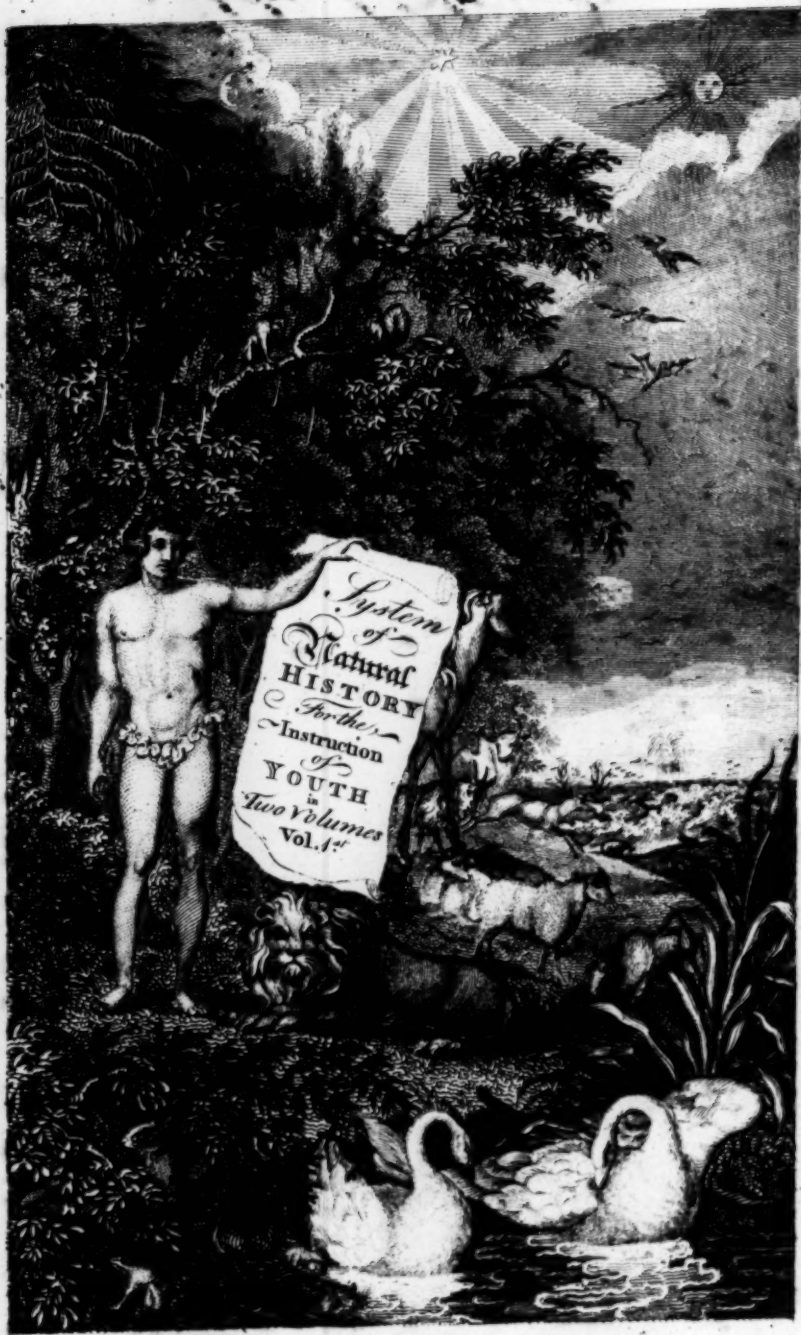




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A

SYSTEM
OF
NATURAL HISTORY,
ADAPTED FOR THE
INSTRUCTION OF YOUTH,
IN THE FORM OF A DIALOGUE.

*Originally written in German, by Prof. RAFF of Goettingen;
now first translated into English.*

VOLUME I.

EDINBURGH:

PRINTED FOR G. MUDIE AND SON, SOUTH BRIDGE;
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1796.



P R E F A C E,

B Y

THE EDITOR OF THIS TRANSLATION.

THE PRESS is an engine, either of beneficence, or of mischief. Arming the MIND with gigantic powers, fitted to move earth and heaven ; it thus lends new weapons to wickedness and folly, not less than to virtue and to wisdom. From this *invention of printing*, a new and incomparably glorious light has sprung, to irradiate all the appearances of nature and of life : But, the gorgeous profusion of colours, which it has diffused, hath often served to disguise and confound the true forms and distances of objects, more than would the glimmerings of twilight darkness. The unjust mandates of arbitrary power ; the absurdities of inept learning, false science, and superstition ; those blandishments of fancy, by which vice awakens and inflames the sensual passions ; the furies of rage ; and the contrivances of fraud ; have, all, their sphere of action enlarged, by means of the *press*. If the *art of printing* have, indeed, augmented the activity of human intellect, and increased the sum of human happiness and virtue ; it has also most probably contributed

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tributed to enlarge the quantity of the vices of men, in a proportion, at least, not unequal to that in which it has improved their virtues.

At the time of the first invention of the *art of printing*, the *press* was placed in such subjection to the authority of kings and prelates; that it could not be made an instrument of the beneficent diffusion of useful truth; farther than these men, in their jealousy, ignorance, and caprice, were disposed to permit. In the hands of politicians and priests, it was employed as an instrument to oppose the advancement of truth and freedom. It was made the pandar of libertinism, and the minion of idle fashion. The good produced by it was indirect; the evil too often direct, and in the intention of its employers. And it is so still. The praise of learning or genius, and the profits of traffic, are, much more than the improvement of the general virtue and happiness of men; the objects sought by publication from the press. Novels, plays, poems, lying narratives of travels, idle disquisitions upon matters remote from the uses of life, and declamations intended to drive men away from the practice of its peaceful duties; compose a very large proportion of those new books which issue daily forth to solicit the attention of the European public: In the best branches of literature, translation, and bookseller-compilation,

compilation, have almost entirely superseded original composition. Of those new books which appear to be ingenuously intended for the useful instruction of mankind, how very few are adapted with tolerable skill to this end?

In these circumstances, every good man will surely endeavour as much as possible, to discourage the abuse of an engine so powerful as the *press*, and to promote the beneficial employment of it. Useful books alone ought to be read or recommended for publication. The necessities of those who need instruction from books ought to be diligently watched. Books ought to be continually more and more adapted to every different rank of intellect. All such books as serve only to amuse idle folly, or to foment evil passions, ought to be studiously neglected, or warmly disapproved of. Genius ought to exert all its powers, in order to give to useful instruction, those advantages of interest, and varied embellishment, which too often accompany the representations that allure to vice.

UNDER a deep impression of the truth and importance of these considerations, was the FOLLOWING WORK recommended for translation into English. It is the most compendious system of all, even the most recently discovered facts in Natural History that will be easily found. Within the compass of these two small volumes is

a 2 comprehended

comprehended the Natural History of the mineral, the vegetable, and the animal kingdoms. The arrangement is wonderfully skilful : the detail is at once interesting, minute, and accurate. It is so cast into the form of *Dialogue* ; that the characters and interests, the simplicity, sagacity, curiosity, and sprightliness of the persons among whom it is discoursed ; give animation, and somewhat of a dramatic power of entertaining ; to the general tenor of the matter, even where it might otherwise fail to command the attention. Here is enough of technical language and arrangement, to prepare the reader to peruse, with intelligence, the writings of the more erudite and scientific naturalists ; yet not so much as to deter the young and unlearned, or to render their progress difficult. *De Buffon's* celebrated work is too voluminous, too elaborately eloquent, too much swollen out with refined theoretical speculations, to serve for a manual of natural history to the young, the indolent, and the uninformed. *Goldsmith's* pleasing, but inaccurate and imperfect work, is not now more suitable for this purpose than *De Buffon's*. The late ingenious Mr. *Smellie's* book, quaintly named *The Philosophy of Natural History*,—not to speak of its other defects,—is too much tainted with a pert superficial spirit of infidelity. All the more elaborately technical writings, upon subjects of Natural History,

tory, are obviously unfit for the purposes for which the present volumes are intended. None of the *Lilliputian* compends of this amusing science, which have been provided professedly for the use of children, is sufficiently complete or correct, or even recent in its information. The compilations of *booksellers* and *engravers* are indeed sufficiently numerous, and in almost every different form ; but of what use are they, unless to be circulated as so much paper and print, until they, in due time, find their way to the oven or to the jakes ? Nor is there any system, whether extensive or compendious, embracing, like the present small work, the whole range of natural history ; and, at the same time, descending, as this does, to all the most recently discovered facts. If then, Natural History be a department of knowledge worthy of being generally cultivated ; this *Small System* may probably be as eagerly and advantageously read in *English*, as it has already been in *German*, and in *French* !

And what study can be more highly or universally useful than that of Natural History ? It embraces all the primary objects of human knowledge. It describes all the appearances, and records all the changes of nature. The rest of human science, does nothing more than trace new relations among things with the existence of which Natural History first made us acquainted.

The

The infant, upon his first entrance into life, is necessarily led to employ all his opening faculties, in observing the exterior qualities of the objects immediately around him. As he advances, and his powers expand ; his fondness for novelty, his impatience of constraint, his restless activity ; are all so many sentiments, which nature kindles up in his breast ; in order to impel him to the acquisition of that knowledge of her works which is necessary to qualify him for the duties of life. When we call him away from this pleasing education, which nature, with the happiest success, bestows ; to open our books, and to learn the language of our abstractions ; he obeys the call with reluctance, and long profits comparatively little by our pains. That education is ever an unhappy one, which labours more anxiously to load the young mind with words, than to acquaint it particularly with the things in nature which those words are employed to denote. It is miserable, to teize a boy, to learn the terms of our abstract ideas, with such tormenting industry, as to cramp the growth of his faculties, and to render him incapable of abstracting for himself. Would we imitate the example of nature ; or study the wisest means of preparing the youthful mind for the duties and enjoyments of life ; we should assign to Natural History an earlier and more considerable part, and to languages

guages and abstract science, a part later, and subordinate, in the domestic, scholastic; and academical education of youth. The knowledge of the moderns has been by nothing more usefully improved above that of the ancients, than by our more diligent and successful cultivation of the province of natural history. Natural History, in spite of the prejudices of those who were blindly attached to ancient modes of institution; has, in the latter part of the present century, been continually more and more adopted into the system of the education of our British youth; and its utility has become still more and more apparent, the more it has been thus studied. Not but that there is a sort of *gim-crack*, pedantic study of the mere husks of this science, which tends rather to enfeeble and deprave the mind, than to invigorate and enlighten it.

The importance of Natural History, therefore, as the first grand field of useful knowledge; the advantages which this small work possesses above most others; as being at once compendious, full, easily intelligible, and entertaining; and the propriety of employing the *press*, rather beneficently than mischievously; have altogether concurred to suggest the publication of these volumes.

Both the *Letter-press*, and the *Engravings* by which it is illustrated, have been executed

cuted in the least *expensive* style, in which it seemed likely that they might be useful, Books are, now a-days, commonly printed and bound in a style so sumptuous, that none but the opulent can afford to purchase them. A book so useful as the present, ought to be accommodated to the œconomy of persons of all ranks.

The translation into English has been executed by a young gentleman for the sake of his improvement in the art of composition. It will be found to be, for the most part, correct, simple, and elegant. It has been executed from the *French*, not from the original *German*. But the work was understood to have been improved in the *French* version. And the GERMAN language has been hitherto little studied among us. But since we in *Edinburgh* have now an opportunity of studying a language in itself so vigorous, copious, and musical; and so rich in the noblest productions of genius, taste, science, and erudition; under MR. WILLICH, a man excellent in his morals and manners, and eminently adorned with the accomplishments of a profound and elegant scholar; it may be expected that we shall apply to learn it with a general ardour, which will soon make it more commonly and better known among us than the *French*:

R. H.

EDINBURGH, Nov. 8. 1795.

THE

INTRODUCTION.

MASTER.

GOOD morrow, my young friends ; what are you amusing yourselves with to-day?

PUPILS.

You promised to us yesterday to go with us to the wood to look for bird's nests : you have not forgot?

M. I recollect. But there is such a furious wind as would render our journey to no purpose : hear how it blows?

P. But do you not think that we might still?

M. We shall make a trial, if you wish it ; but you will see that we shall have enough to do to run after our hats, without attending to any other thing. To-morrow, if the wind be moderate, and provided it does not rain. Besides, at present, I have something that I am anxious to do : I must run to my chamber.

P. Ah ! no ; or we will go along with you ; may we ?

M. So I am to be a prisoner ; and with such a set of little jailers. Am I ?

P. You are going to read these two books
b 2 which

which you have under your arm : for you are always reading we know.

M. These little knaves, that get all my secrets !—It is true ; this is said to be a charming book ; and I am quite impatient to see the beginning, the middle, and the end of it.—Besides, the binder has just brought it home this moment ; and I must see that he has placed the prints right, and if he has not spoiled my book in the binding.

P. Ah ! prints, prints ! may we not see them along with you, dear Sir ? You have always been promising to show us some.

M. Be it so !—And since that is the case, we need not go farther ; we have only to go to this table. Let us see what we have got here.

P. Give us one, while you look at the other.

M. In that case, we shall not see the plates together.

P. Yes, yes, let us see them together ; you will tell us what they are.

M. (opening the book) Ah ! I see at once, you will know these as well, perhaps better, than I do. There are birds, fishes, hares, apes, cats, pear-trees, apple-trees, gooseberry-trees There they are of all kinds.

P. Ah ! goodness ! what a number of them ! and such shapes ! what horns, ears, muzzles ! And this large trunk. like a large reed, with such large, large leaves ; is this also a tree ?

M. There should be several here nearly resembling that : we have only to look at the number, we shall know what it is immediately.

P. But I have never seen any like that : where do such trees grow ?

M. They grow in countries that are a great way

way from this, and where the climate is much warmer than ours.

P. What ! even in summer ; when it is so warm with us, that a person is like to be stifled ?

M. The heat there is perhaps not much more intense than it is here in our warm summer-days ; but then the warm season continues much longer there than with us. And this is necessary to the production of some kinds of trees, that bear excellent fruit.

P. None of them are brought into our country, then ?

M. No, my young friend ; and it is indeed a pity. I am very fond of the fruit of all these trees.

P. Have you then been in these countries, that are so far off and so warm ?

M. No, indeed. But I have, however, eaten of the fruit of these trees, for they are brought to this and several other countries.

P. Might we too, then, eat some of them ?

M. Observe the little epicure ! I fancy he would undertake a voyage to these countries for the purpose of feasting on the fruit.

P. But you say that they are so good : and since some of them are brought thither, we have no occasion to go so far in quest of them.

M. This may be called reasoning ! Since it is so, I give you my word, that you shall eat to-day some of the fruit of that very tree which you have noticed.

P. And shall we indeed, dear Sir ? What is the name of it, then ? do we know that also ?

M. We shall see : but you must have patience, for I do not dress it.

P. Is it true, then, all that is in this book ?

These are not stories, as in this book of fables which you gave us to amuse us ?

M. You know that I have not read the book myself ; so that I cannot be certain yet if it be all true. But we shall endeavour to ascertain that, as we read it, so that we may not be deceived.

P. Shall we read this whole book with you, dear Sir, and the other also ?

M. With all my heart, my young friends ; and I shall be happy to do so. But then you see that will take me a much longer time than if I read it alone. I must therefore see whether I have time. It will take.

P. O yes, dear Sir, you will have time enough, if you really wish to do it.

M. So that whenever I chance not to have time to amuse myself with my young friends so long as I could wish, a little knave will tell me instantly that I want the inclination !

P. Yes, indeed, indeed, ... there can be no other reason.

M. Come, I see I shall get no quarter from my young friends. Well, since it is so, let us forthwith take a look at the beginning. I hope you will be satisfied with me ?

P. Let us see, dear Sir, how it begins.

M. Here, look yourselves.

P. (reading) An Abstract of Natural History These are histories, then ; are they not, dear Sir ?

M. And farther, they are *natural histories*, or, to speak more properly, they are parts of natural history that have been abridged to render them easier retained upon the memory.

P. But we have already had books of history,

INTRODUCTION.

story, which had not upon them, like this, Natural History.

M. Undoubtedly, because they were not books of natural history. You perhaps recollect the title of those books of history which you have had ?

P. Certainly ! One of them was called, *The History of the Kings of France*.

M. And what did that history treat of ?

P. It treated of the kings of France, and of all that they did, their wars, their marriages.

M. Did it not likewise make mention of the people of France, and of different personages !

P. Yes, truly ! for instance, of several dukes, counts, barons, and many other things.

M. Exactly, you are right. It is the history of all these great personages, and of the French nation. It was not the history of animals, trees, metals, foxes, beavers, stags, eagles, partridges, &c. ; there is the difference.

P. But have foxes and partridges likewise kings and dukes, that their history is written too ?

M. As a history of kings and dukes treats of these great personages ; so does a history of cats and mice treat of these animals.

P. But do they also make war upon one another ?

M. I believe they do. And as the transactions of kings and dukes have been recorded, so we shall see in our little book, what sparrows and hawks have done.

P. And trees and fishes, have they too done something ?

M. Observe. Trees are quite different. They produce different kinds of fruit, they grow in different

different ways, and in different countries. Fishes are likewise of different shapes and different sizes. People inform themselves of all this, and they relate or they write it down: this is called natural history, or history of nature; just in the same way as a description of Paris, or other cities, or that of a palace or church, which you may have read, is in some measure the history of these fine things, which do nothing.

P. And is this description also in natural history?

M. No, my young friends, because these things have been made by men, whilst trees and animals have not. They have been made by Nature.

P. But do not trees grow merely of themselves, after they have been planted, as we have seen peach-trees planted in our gardens?

M. It is because we do not perceive what produces vegetables, minerals, or even animals, that we term them productions of nature.

P. But what then is nature?

M. Instead of saying the works of Nature, we ought to say, the works of the *Supreme Being*, that is *God*: for this word Nature means nothing else.

P. But why has this word been invented!

M. Who is it that has made your shoes, your hats, the clothes that you wear?

P. They are the tailor, the shoemaker, the hatter.

M. That is to say, men, is it not?—And the house that we are in?

P. It has been built by masons.

M. By masons, carpenters, and other workmen. And all the neighbouring houses?

P. By workmen also.

M.

M. And the houses that we find in the country when we take a walk thither?

P. But they are the same who have built them too, are they not?

M. Yes, undoubtedly; and the fine gardens that we see, who has planted them?

P. They are the gardeners.

M. Very well. And the fine fields in the neighbourhood, who has cultivated them?

P. They are the labourers.

M. And the villages round about, who has built them?

P. They are the peasants.

M. And all the cities of this and of the neighbouring kingdoms, and all the villages?

P. They are likewise labourers and peasants. (one of the others interrupting). But I read yesterday, in my book of history, that the city of was built by

M. That is to say, by the orders of such a king, who had employed for this purpose the necessary workmen.—And the canals that we sometimes meet with, or those large canals that are mentioned in the history of the country, who has made them? These fine roads, who has made them?

P. The labourers also.

M. And the fine vessels of which we have a print here in this plate, and in which people travel upon the sea; who has constructed them?

P. Labourers also; have they not?

M. Yes, ship-carpenters.—And all these labourers, and all those who have given orders for so many works, either upon sea or on land, what are they?

P. They are men; are they not?

M. Certainly, my young friends. Thus you see that men have multiplied prodigiously their labours on the land, and their works are every where situate beside trees, plants, mountains, &c. which have been produced without being made by men, like cities and vessels.—The word Nature, then, has been invented to express at once whatever is produced without the operation of men ; so that men themselves are a part of nature, in other words, are the works of the *Creator*.

P. This, then, is what is contained in this book, and men are likewise included in natural history?

M. Undoubtedly, my young friends ; we shall there see the history of man with that of other animals. But this will not be the history of the actions or of the labours of men. It will be a description of our body, and, as far as may be necessary, of the faculties of our mind. All this, together with the face of the universe, which the Creator has presented to man's eyes, and given up to his enjoyment, makes the complete history of nature, such as it appears in the four seasons of the year.

P. These are the spring, summer, autumn, and winter ; are they not ?

M. I see that you have read the almanack.

P. We have likewise observed, how every thing becomes green again in the spring; and the birds return to the woods, because the leaves shoot forth again, and the trees are all in flourish, and there are nosegays in the gardens. . . & .

M. Is not this as if nature put on a new suit; because, in reality, she re-assumes her robe of green; the fine season returns, and the nightingale,

nightingale, and the lark, and all the birds send forth their melody as a tribute of thanks to the all-powerful Creator, who restores every thing to life upon the earth.—And the summer, how find you it?

P. In the summer it is extremely hot. Then people reap the corn, and mow the hay; do they not?

M. No doubt, the heat of the sun is a little incommodious, but then it ripens the corn, as you observed, and the hay, and all sorts of herbs and fruits, and cherries, and gooseberries, and peaches, and melons, and so many others. Without summer, my good friends, we would die of hunger.

P. And without autumn we should die of thirst.

M. (laughing) Ah the little drunkard! Father Gregoire could not have hit it better.

P. But should we not drink, then, dear Sir?

M. Without wine, we would be obliged to put up with water, or with cyder, or with beer; and with any of these we would not die of thirst. At last comes winter; all is dead, naked, sad.

P. Then is the time for sledges, for hunting on the snow, for balls and masquerades.

M. Yes; but other animals do not go to balls and plays.

P. But what become of the poor birds and fishes, when every thing is frozen up, and there is nothing on the trees or bushes? Do they not all die, dear Sir?

M. That would be sad indeed, my young friends. But they do not. Nature, or rather the great Author of Nature, has taken care of them. Winter is seldom so severe but, in the midst of snow and ice they can find their nourishment;

ishment ; besides, they are then clothed with a thicker robe of fur or feathers ; so that seldom any of them die of cold or hunger. There are some, indeed, that do not take nourishment ; but these again remain plunged in a kind of lethargy or sleep, from which they do not awake till spring ; for instance, bears, marmots, hedgehogs, bats, frogs, toads, &c.

P. But the fishes that are in water, beneath the ice ?

M. Provided the water in ponds and rivers be not frozen to the bottom, fishes do not suffer ; and we seldom see frosts so severe as to do that.

P. But the birds that disappear, as larks, swallows, nightingales, what become of them during winter ?

M. Some conceal themselves in holes of trees, others migrate into warmer climates, into Africa, America, Asia, whence they return to us in spring.

P. And is that indeed possible ? But is it not cold there also ?

M. There are countries in these parts of the world which I have named to you, where neither snow nor ice are ever seen : but the heats are much longer, and more intense than with us. There are also countries where nothing but snow and ice are to be seen through the whole year, save only for two or three months, when it is extremely hot. Our climate is better than any of these, even during winter, when men and animals suffer a little, but do not die.

P. And do insects not die either ? for instance, may-bugs, stag-beetles, &c.

M. Some insects dig a hole in the ground on the approach of winter, whither they retire, before

before the frosts, to a depth that secures them from cold. Others deposit their eggs in autumn, and die immediately, without giving themselves any concern what may become of them. In spring or summer, however, there are produced from them worms or caterpillars of every shape, which subsist on leaves and other things, till such time as they change their form, and become flies and beetles, like their progenitors.

P. What ! these nasty caterpillars too, some of them enough to make one vomit ?

M. Why not ? Each of these caterpillars has its particular beauty, either in its structure, or in the colour and spotting of its skin. As the Creator can nourish and support every living thing that he has placed upon this earth, so he can likewise, by means of the vilest of these insects, produce admirable operations.

P. But has God then made flies and caterpillars ?

M. Do you not think it wonderful that so small a creature should be possessed of life, an instinct, a head and a body, furnished with organs exquisitely delicate, with nerves, solids and fluids, rings that move one upon another, eyes, feet, a stomach to digest, in a word, with a multitude of things that are inconceivable. Or do you know any person who can do as much ?

P. All that is very true ! but when we crush a caterpillar, we crush all these fine things ?

M. Yes, indeed ! God is so rich, so powerful, so inexhaustible, that he can thus lavish away master-pieces of the utmost perfection ; so that we can scarcely avoid crushing them as we walk along the road.

P.

P. How sorry I am at having crushed so many ! When I find any more of these creatures after this, I will only keep them till I meet some person who can tell me their name, and then I shall let them go. — There are some people who torture them most cruelly ; I cannot like such people.

M. Ah, my young friend ; you think just as I do : I would suffer every thing to live, that has received life from the Creator, as long as possible.

P. But when we eat veal or mutton, or fowl, are not these also animals ?

M. No doubt, my young friends. But we must live ; and on this earth, on which God has placed us, he has given us nothing else to eat than master-pieces of his omnipotence, whether we eat vegetables or animals. Every thing that he has placed around us is for our service and use, in one way or other.

P. But are there not a number of animals that are wicked ; for instance, cats, that scratch, and steal every thing that they get a hold of ?

M. They are not wicked for that reason. They must live where they are placed. If we had left them in the woods, instead of introducing them into our houses, they would not have stolen in our kitchens.

P. But the rats likewise would eat us.

M. Then we must suffer the inconveniences of their society, in consideration of the unintended services which they render us.

P. But when they scratch us, this certainly proceeds from pure wickedness.

M. Well, my young friends, take the pleasure of observing some day how the cats live together, and you will perceive that this is a way

way of carressing, which the males and the females use with one another. Thus, when we play with them, they likewise play after their manner. We are very wrong to find fault with them, or to accuse them of wickedness, because we forget that their paws are not made like our hands.

P. We must not strike cats, then, when they scratch us?

M. We should take care not to place ourselves in a situation to be scratched. But you yourselves see that animals are not wicked, that is, they do nothing from malice; and that all the works of God are good, as we read in the History of the Bible.

P. But flies and gnats, fleas and bugs, that often give us not a moment's rest, day or night, are they good for something also?

M. Have you not seen how the gardener catches the moles, which eat the roots of plants, and do mischief in gardens, or how he rids the trees of caterpillars?

P. Yes, he has little traps for the moles, with which he never misses one, and papa gives him twelve pence for every one that he catches.

M. Well, you see, that if animals incommode us or do us hurt, it is our own fault. We can defend ourselves against all their depredations, when we take the trouble to seek the means. The case is the same with wolves that prey upon our sheep, and which we kill in the chace, as well as foxes, which come even to our houses to steal our poultry; and serpents, and all the rest of that tribe.

P. But we cannot do any thing with these animals after we have killed them.

M. Have you never seen muffs made of foxes skins,

skins, and furs, of bears skins, and so many others? It is true, that the insects which torment us in summer are of no other use to us than to bring to our mind every moment the inexhaustible fecundity of the Creator; though the greater number of them serve for nourishment to the little warblers that regale us with their song. We have only to take care of their stings, whilst we admire them as they deserve.

P. But birds too, frequently do us mischief, do they not? The sparrows eat a great deal of grain when they can get it.

M. It is true: but then we eat birds. Besides, they are pleasant little animals that entertain us with their musick. We ought to treat them like little musicians, which are not paid in money but in kind. Though they may steal a trifle from us, still the best and principal part remains, and they have never produced any scarcity.

P. As to myself, I am very fond of the little sparrows, and I have no objections to their eating a few grains of corn.

M. You say right, the bountiful God knows well what he has made, and it does not belong to us to criticise his works. He keeps an open table for every thing that lives; and when he gives us harvests, we may well part with a few grains, or a bunch of grapes, or a few cherries, or such things, to the birds. We ought to say, like the good husbandman, as he scattered the seed in his field, saying to the first handful, *this for my neighbours* (meaning birds and field-mice); to the second, *this for my master*; to the third, *this for myself**.

P.

* This story is true: and the farmer is still alive. His name is A and he lives in Brie, in the neighbourhood of the village of Coincy l'Abbaye. The above are his own words.

P. Is that indeed true? That was a good man, was not he?

M. An excellent man, and his affairs did not prosper ill. His neighbours and his master left him enough to recompence the good will and the gaiety with which he laboured for them.

P. But did he never frighten away the birds from his fields?

M. He was a good marksman, and he killed as many of them as he could. But as there were so many that he could not kill, he knew well he would still have plenty of these neighbours to eat that portion that was allotted to them, and he did it without regret.

P. But are there a great number, then, of beasts and of birds.

M. There are thousands and millions of species. As to plants, and trees, and shrubs, the case is the same with them. Beside all these, there is also that whole class of bodies called minerals or fossils. Of all these, there are vast numbers.

P. Are all these in our book, and in the prints?

M. They cannot be all in it, because many of them are not known, or have never been seen.

P. But how can it be known that there are many more, since they have never been seen, and are unknown.

M. Because, when a new country has been discovered, there have constantly been found in it a number of new species of animals and plants. Now, as many similar countries still remain undiscovered, there is reason to believe, that they contain a number of animals and plants which are hitherto unknown.

P.

P. But how is it possible to recollect all that, so as to insert it in books?

M. I shall tell you that by and by. Have you observed how your mamma, with her servants, arranges the whole linen of the house in her presses and drawers?

P. Yes. She puts all the bed-linen by itself, the small apart for us, and the large apart also for the big beds.—Then she places the shirts in another place, those for papa, and those for herself, and then ours, each of them apart—and then the table-linen, the towels, and the napkins, each of these apart, and likewise the coarse apart from the fine—and after all that the——

M. Well, you see how you retain all this on your memory, though you had no design to get it by heart! The case is the same with the clothes and the plate, and the stone-ware, and all the rest: you could give an account of them all with ease, though the quantity be very considerable: could not you?

P. I wish that I could: now for instance——

M. I shall save you that trouble. I only wish to make you sensible that the same thing must be done with the subjects of natural history. We shall take first a large press for animals, and then we shall put in each drawer—You laugh, my young friends?

P. The press must be very large, dear Sir?

M. It will not be a real press, my young friends. We will just suppose that we have a great large press, with a number of drawers. Upon each drawer we will put a figure or letter, to keep us in mind of it. We will then place in each drawer certain species of animals, that have a great resemblance to one another; for instance, beasts with four feet, or quadrupeds; beasts with feathers,

feathers, or birds; aquatick animals, or fishes, &c. In the mean time, we will write the names of each species in a paper-book, in the same order in which we would arrange them in our drawers, each in its place.

P. And then a page will answer for a drawer?

M. Exactly. The very thing that I was going to tell you, and you have discovered it yourself.

P. In this case, a large paper-book will supply the place of the large press; will it not?

M. Precisely. But this is not all. We must have another large press or paper-book for vegetables, or trees and plants of all kinds, in which we will have a drawer or page for each species.

P. So that in this way we shall have two large paper-books?

M. Undoubtedly, one for each class, or, as we generally speak, for each kingdom—

P. Is it called a *kingdom*, dear Sir?

M. Yes: each large class has been supposed to form, as it were, a separate kingdom.

P. But this is not like the *kingdom* of *Louis the Great*, or of *Henry the Fourth*?

M. No: the word is used in different senses. By the *animal kingdom*, we understand the whole class of animals taken together, each according to its species.—By the *vegetable kingdom*, we understand the whole class of vegetables taken in the same way.—And by the *mineral kingdom*, we understand the whole assemblage of *minerals*.

P. Then there are three kingdoms, so that we must have three large presses or paper-books?

M. Thus we will set apart every thing that the Creator has placed either upon the land, or under its surface, or in the water, in the same way as your dear mamma.—

P.

P. But shall we not make a book for what is contained in the air?

M. Why that? what is it you mean?

P. Do not the birds fly in the air, and the flies also, and the may-bugs?

M. Well, all these fly in the air, in the same way as fishes swim in the water.

P. But we shall have a large book to contain the fishes?

M. That is true; and we shall have another to contain every thing that lives upon land, and a third for whatever is lodged within its bowels; taking care always to distinguish animals from vegetables and minerals.

P. But you do not speak of making a book to hold likewise what is in the air?

M. And what is it, my young friends, that is in the air?

P. Did you not say just now, that birds fly in the air, in the same way as fishes swim in the water?

M. And what is it in which you, yourselves, run?

P. In what?—We run upon land.

M. But when you run fast, what is it that you feel strike upon your face?

P. We feel like wind.

M. Exactly: just as when a bird beats the air with its wings near your face.

P. Yes, the very same. It is air likewise, is it not!

M. Of course, we are in the air as well as birds, though we cannot rise so high. All animals are in the air, except fishes; but as they all find their subsistence on land, and all seek their retreat there, we rather say, that they are upon land than in air. In fact, fishes likewise,
nourish

nourish themselves on the land that is at the bottom of the water ; but as no other animals can live in that element, fishes are distinguished by that abode which is peculiar to them.

P. So we are in the air, as well as birds ! and what is it that is within the earth ?

M. There are certain plants or roots that are in the earth, whence we extract them. But we understand chiefly by that, the whole mineral kingdom. We may say, in general, that minerals are only different species of stones, of several kinds and colours, and of several different compositions.

P. Are stones, too, classed in natural history ?

M. They are creatures also, works of the Creator ; and we derive many advantages from them.

P. But they do not move, they do not increase in size ?

M. Pardon me ; they do increase in a certain manner. Hence minerals are distinguished from animals by the want of feeling, and from plants by their wanting life ; whilst they themselves only grow in the bowels of the earth.

P. But stones continue always of the same size ; and we have never observed small ones to become large ?

M. But they have not been always as you see them. They grow, however, in a different manner from plants and animals ; and as this manner of growing can only take place in the bowels of the earth, it is not surprising that you have not perceived it.

P. In what manner do stones grow ?

M. We must first take notice, how we ourselves and other animals grow, and also plants.

All

All these receive their growth internally. Plants and animals acquire their growth from what they take in, the one by the mouth, the other by the roots.

P. And stones have neither mouth nor roots?

M. That is just what constitutes the difference. What method do you take to make a large mountain of snow, from a small ball not larger than one's hand?

P. We roll it over more snow, and as it rolls it is constantly receiving additions from the other snow, till it become so very large, that we are unable to move it any longer.

M. Now this snow does not enter into the belly of the little snow-ball, in other words, the snow-ball does not eat the other snow.

P. And stones become large in the same way?

M. Not that small stones are rolled on the sand to make them larger; but there are constantly waters trickling through the ground, that hold some kinds of fine sand suspended. These fine particles collect, and adhere to one another, and thus form, by degrees, large stones.

P. As when a river collects a quantity of sand in a hole or some corner?

M. Precisely in that way; only in the bowels of the earth the particles of sand are extremely fine, even finer than dust, and adhere in such a way as to form a large hard mass, or rock. This way of growing externally is called *juxta position*; in the same manner as our way of growing internally is called *intus suception*.

P. But these are hard words: why have these been invented, since *external* and *internal* mean the same thing?

M. These are Latin words, and have been retained, because the first books that treat of this

subject were written in Latin, by those whose native language it was ; and because those authors, who wrote on this subject since, preferred this to their own native language.

P. And why so ?

M. Because they thought it a finer language: at present, however, we are of a different opinion. We no longer consider it as indispensably necessary to study, for a great while, an antient language, which is beautiful indeed, though now become a dead one, before we begin to attend to any other thing. Books of all kinds are now written in French, so that we can study any subject that we choose, without being subjected to this inconvenience.—But look, my young friends : in consequence of prating, we have but got a single word of our book read yet, and now there is not time to continue it any longer. Well, we must lay it aside till another opportunity,—and yet I expected to be so entertained this morning ! Come, what's put off, is not lost.

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OF THE

THREE KINGDOMS

OF

NATURE.

MASTER.

WE behold in Nature, that is on Earth, three different kinds of productions :

1. Some there are which enjoy life, sensation, and motion, as horses, dogs, &c. ; for, when they are wounded with any mortal weapon, they die, and cease to act, to move, to eat, &c.

2. There are others which possess neither sensation nor motion, but life only ; whereby we see them grow and increase, and when they are hurt in a certain manner, they cease to grow, to enlarge, and to produce, and become dry, and even rotten ; for example, flowers, trees, herbs, &c.

3. Lastly, there are other productions which not only possess neither life, nor sensation, nor motion, like the animals we have mentioned in the first place, but have not even that species of life or vegetation which the plants last mentioned enjoy ; these are stones, earths, metals, &c.

B

These

2 THE THREE KINGDOMS OF NATURE.

These three species of productions thus distinguished, form the three divisions or classes, which are called *The Three Kingdoms of Nature*.

The *first* is the Animal Kingdom, under which is comprehended every thing which possesses life, sensation, and motion; that is, all animals, whether on land or in water, or even within the earth; as the rat, the elephant, the worm, the frog, the whale, &c.

The *second* is the Vegetable Kingdom; in which is classed every thing possessed of life alone, without motion or sensation, viz. all vegetables or plants, great as well as small, whether above or beneath the earth, or in the water; as the pear or apple tree, sugar cane, lettuce, &c.

The *third* is the Mineral Kingdom; under which arranged every thing which is void of life, sensation, and motion, and has only a certain mode of formation and of increase; that is to say, the earth itself, stones, and every thing of the same nature which is concealed in the different kinds of earths and stones; as lead, iron, silver, gold, &c.

Pupils. And which of these three, good master, will you first instruct us in? Ah! if you please, the vegetable kingdom?

Master. With all my heart; for, every moment when we walk in the gardens, or in the meadows, in the fields, in the woods, or on the hills, we find beneath our feet, and around us, an infinity of herbs, of plants, of flowers, of shrubs, and of trees; and I cannot help thinking, I hear them crying out to me, "Man! do you know me? do you know who made me? do you know my name? do you know in what respects I can serve you?"

P. O! how I wish to know the names of all these

these beautiful little flowers which grow in the meadows!

M. Yes, we pluck a flower, and are ignorant of its very name;—or, while we walk, we eat some fruit, or some enticing cluster of berries, without knowing any thing of them!

P. But, Sir, are all these little red or black berries which we find in the woods, or among the bushes, fit for eating?

M. No, no, my dear children, abstain from eating any of these things, until you learn what they are, although they be beautiful to the sight: many people have been hurt by them, others have even died.

P. I have been told they are poisonous.

M. It was fortunate you were told so; others have not been so lucky. These pretty little fruits, however, are not all equally noxious: there are many which may be eaten, at least, without danger, and some which are very agreeable.

P. Ah! I wish I knew how to distinguish them instantly!

M. And I also; but we will soon become acquainted with them, on perusing this little book.

P. But are there not also herbs which are fit only for beasts?

M. Surely; sheep and oxen feed on grass; goats bruise young shrubs, all without knowing what they eat or bruise; we ought not to be so ignorant as these animals.

P. For my part, I wish to learn the name of every thing which is produced in the garden, and in the meadows; and, when I cannot find it out, I shall bring part of it home with me, and you will tell it me: will you not, Sir?

M. Bring it, bring it, my dear, we shall soon discover what it is, whether it be used as a me-

medicine for men or for beasts; whether it be for eating only, or for dyeing, or for what other use it is fit; we shall soon become naturalists and botanists.

P. Do you thereby mean that we shall learn natural history?

M. A naturalist is he who makes that science his principal study; a botanist is he who chiefly studies botany, as we mean to do.

P. Shall we study botany?

M. We shall: Botany is the knowledge of plants, or of the vegetable kingdom of nature.

P. Oh! how I long to be a botanist!

M. Well, we can begin immediately: let us turn up this book and learn in the first place what a plant is, with all that forms or composes it, that is, all its parts.

OF THE
VEGETABLE KINGDOM,
OR OF
PLANTS.

THE name of *Plant* is given to every terrestrial production which is deprived of sensation and motion, but which grows from the earth, until a separation takes place, whereby it loses its life and power of increasing; for example, trees, shrubs, grass, mushrooms, &c.

Some plants live only a few hours, others half a year; others again exist not only a whole year, but even five, ten, thirty, sixty, or eighty years. The oak is said to exist for four or five hundred years.

All plants have roots which penetrate the earth; whence they derive those juices whereby the plant is enabled to shoot forth and produce leaves, flowers, and fruits. Nevertheless there are some plants which float on the water with their roots; and all sorts of bulbous plants may be reared by placing their roots in water, as hyacinths, tulips, &c.

Every plant is covered with a spongy substance, named the bark, under which lies the wood, in the center of which is what is called the pith. The bark is the most essential part to the life of a plant; for, if a tree or shrub, or any other species of plant, be stripped of its bark, it necessarily dries up and perishes. The foliage is not
equally

equally necessary to its existence. If, however, that be carried off all at once, the plant will thereby suffer in a very considerable degree.

Every plant produces flowers, which are succeeded by fruits or seed. Thus flowers are not simply ornamental, but are parts of the vegetable generation, by which plants produce seeds of different sorts; whereby, afterwards, new plants, similar to the first, are obtained. Many of these flowers throw around them an agreeable perfume; but all of them are replaced by something equivalent to fruit or seeds. Some of these seeds are clothed with a thick pulpy substance, agreeable to the taste, and good for eating; for instance, those of the apple, the plum, the peach, &c.

P. Ah! that is a very singular thing! I always believed flowers were only meant to have a fine smell, or to please the sight, their colours are so charming.

M. Not at all, my dear children: the Creator has been pleased to adorn with a thousand delights every thing which conduces to multiply his creatures; but we must not mistake these ornaments for the most essential part. From the flowers are produced those seeds which are called fruits.

P. And are all the fruits only seeds for the purpose of producing other plants! for my part I thought fruits had only been intended for eating.

M. The admirable arrangement of the Creator has given to many fruits or seeds a covering which presents us at the same time a wholesome and delicious food; and, in others, the seeds themselves are good for eating, as almonds, pulse, corn, &c.: but you must never deceive yourself, nor forget that fruits are only seeds.

P. Is wheat also a fruit, and pease, Master?

M.

M. It is true, we are not accustomed to give the name of fruit to any seeds but to those of fruit trees; but naturalists speak in a more exact manner.

P. But are no other parts of a plant, except seeds or fruits, fit for eating?

M. You eat every day potatoes, radishes carrots, turnips, &c. these are the roots; you drink tea, which is made with the leaves; you eat sallad, cabbages, &c. these also are leaves and stalks.

P. Are these great mushrooms which we find in the woods also plants?

M. Yes, without doubt; all mushrooms are a kind of plants, which have neither leaves nor flowers that are visible, and which comprehend in one piece all the powers which others have in several.

P. But who can sow them then, or are they planted?

M. Neither the one nor the other; they rise of themselves from the earth, or, as it is called, spontaneously; they are a spontaneous production.

P. Spontaneous! of itself! What then, is not every thing sown which is produced?

M. Almost every thing in the garden has been sown or planted, as well as every thing in the country, excepting the common grass, and certain briars and brambles, which it is useless to plant.

P. And are these great woods planted likewise?

M. The greater part of them have not been planted, and are spontaneous; but this is not the case with a number of them. Among others there is a great oak forest in Transylvania which
was

was planted by an army of 20,000 soldiers; who, having been made prisoners of war, the conqueror caused them to be yoked like horses to cultivate the soil, which he afterwards ordered to be sown with acorns, whereby this great forest was produced.

P. And do these oaks take a long time to grow?

M. They do, because they last a very long time—four or five hundred years, as I have already told you. But there are trees which are produced from seeds in a very short space; some also grow by planting nothing more than a branch in the earth, like the willow. And other plants do not require so much time to grow; some of them take no more than a single night, like certain kinds of mushrooms.

P. But what then do you call those kinds of green leaves which grow over the branches of the apple tree, without resembling its other leaves, but which have also stems of their own?

M. You may very frequently see the very same thing on the oak and other trees; you probably mean misletoe; and there are several other plants of the same nature, which grow upon trees, and are nourished by the juices which they steal from them; they are therefore called Parasites; a name which is given to a set of fellows who endeavour to insinuate themselves by flattery into the company of rich people, and thereby obtain a place at their tables.

P. What was our gardener about when he was fixing the branch of one tree into the trunk of another?

M. He has been ingrafting one tree in another: this operation is performed in different ways which we shall notice hereafter. It is an amusing

sing thing to produce from the same tree a variety of different fruits, as pears, apples, quinces, and peaches, all at once: have you never seen that?

P. Oh! yes.

M. But let us walk into the garden, we shall examine all these things at our leisure, and receive greater pleasure and amusement.

P. Let us go! but shall we not take the book along with us?

M. Surely, that we may see whether the figures in the book resemble the plants in the garden.

P. Ah! there's the parterre—I wish I knew the names of all these flowers.

M. You see there the auricula, the primrose, the blue violet, the pink, and the hyacinth, which last is a spontaneous production of Persia; the tuberose, the narcissus, and saffron, all which exhale an agreeable perfume, and are the first gifts of spring.

P. Wherefore is it that all the other flowers are not blown at the same time?

M. It is by the design of our Maker, who, that the earth may be adorned in every season, has formed the flowers in such a manner, that some require a greater degree of warmth, other, a less; some require to imbibe the juices of the earth a great length of time; others require them only for a short period, before they are enabled to display their beauties. From this results a more pleasing variety than if all the flowers blossomed at once, and endured together throughout the year.

P. And what flowers will come after these?

M. When these are past, the crown imperial lilly, the tulip, the iris, the ranunculus, and the
jasmine

jasmine, begin to appear. About the same time also the rose shows forth its magnificence, with the white lilly, the carnation, and gillyflower.-- These are succeeded by many others, particularly the rosemary, always green, which grows without culture in Spain and Italy.

P. And have not all these flowers a fine smell?

M. By no means,— there are several which have no smell at all; for, although there the humble violet, which modestly hides its head among the grass, rewards by the sweetest fragrance the labour of the person who discovers it; yet here is the tulip proudly raising itself, and making a superb parade of its glaring colours, which cannot affect the smell, and is only qualified to flatter the sight. The pink, on the other hand, unites beauty of colours with the most agreeable odour. There the gillyflower spreads its sweet exhalations only during the evening.

P. Should we not now see if the prints resemble the flowers?

M. Undoubtedly ; you have only to compare the copy with the original.

P. Truly that is exactly the way in which the tulips are formed, and there also are hyacinths; but they are not coloured.

M. Indeed, they are not; and the colouring is an essential want, especially in the representation of flowers. The prints, however, might be coloured in such a manner as to represent all plants very naturally; but it would be attended with considerable expence, which induced me to think of making an herbal, rather than having only these representations on paper, where we see nothing but black and white.

P. But what, pray, is a herbal?

M.

M. - It is a very useful and very agreeable thing; but the making of one is attended with trouble, and is very tedious, which has disgusted me with it; besides, it requires the assistance of several persons. An herbal then is a book of plants, of real plants, and even of trees, just as we find them growing on the earth.

P. And how then can such a book be made, especially when there are trees in it?

M. It is not by any means a very difficult thing, but it is troublesome, when a single person undertakes it: for, though it may appear strange to place trees therein, yet it is not so. It is true, it would be impossible to put a whole tree in a book; but we take small parts of a green branch, leaving attached to them a little of the bark, and of the wood, and, after having dried them in the air, we extend all these little branches between the paper leaves of a large white book, arranged for the purpose, and, when the book is full, we compress it between boards, loaded with heavy stones, or other weights, to flatten and smooth it properly. With regard to the lesser plants, the matter is not so difficult. We take a whole one, if it be not greater than the book, or else a part, corresponding to its size, with the leaves, the flowers, and sometimes the fruits, all newly gathered; then, after having dried them in the air, we extend them also in the book. In short, when all this is finished, you are possessed of a herbal, where you preserve all the plants in their natural state; but it requires the assistance of several hands to fix and stretch them upon the paper, as well as to collect them in sufficient numbers, without losing too much time in the research.

P.

P. Ah! Sir, we shall procure as many as you want; let us have a herbal.

M. When you have made me begin, I am afraid you will not continue to the end, but leave the work unfinished.

P. Ah! no—I promise you we will finish it.—we will surely finish it.

M. Why then, I wish to begin, and to morrow we shall set about preparing the paper. In this garden we shall find at first enough to enrich our herbal considerably; and afterwards we shall go a gathering in the country.

P. But what, pray, is that which is always green!

M. It is the box tree.

THE BOX TREE.

THE box tree, during winter and summer, is continually clothed with verdant leaves. It is distinguished into two species, the great and the dwarf. There is, however, in reality only one species; and the small size of the dwarf box is the effect of art, and of constraint, or of the soil; the quality of which is unfavourable to the entire growth of this tree. Nevertheless even culture cannot raise its trunk to any considerable height in this country.

In Piedmont, in Savoy, in the kingdom of Naples, and island of Corsica, whole forests of box are to be met with, where some of the trees are so large that a man cannot encompass their trunks with his arms. There the tree is multiplied by suckers and seeds, as also by branches cut in April, and planted in the moist earth. The dwarf box does not flourish, and is multiplied by the division of its

its roots. There is also a kind of great box with gilded leaves: in Italy its branches are used for brooms: its wood is of a yellowish colour, very hard and heavy; it does not float in water, and is never attacked by worms: it is of great use to joiners, turners, and flute-makers: they make of it flutes, hautboys, combs, and all sorts of toys for children. After much rain, the box exhales a strong and disagreeable smell.

P. What is the name of these flowers there?

M. These are Spanish pease, that is the poppy, these are lillies of the valley; here are fruits; these are strawberries; yonder are raspberries; there are gooseberries; and beyond them currants; there again are other flowers—the eye-bright, the marigold.

P. Is not this a laurel, and this a citron, and this an orange tree; but why are they in boxes?

M. It is because these trees cannot very well endure the cold; so that, to preserve them during winter, they must be shut up in warm places, as in rooms kept warm with stoves, or in green-houses, which are also made use of for the preservation of many delicate plants and flowers: but in Spain, in Portugal, and in Italy, and other countries where the climate is warmer than ours, they grow in the open field, and remain there summer and winter.

THE LAUREL TREE.

THIS tree grows without culture, in great abundance, in Italy and in Greece, in the fields and in the woods, wherever its berries or seeds may have happened to fall. There are several species of them, but this which you see is best known,

known. It has an aromatic smell and taste; on which account its leaves are frequently used to season dishes. Its berries resemble a little red cherry; and, when the stone is stripped of its brown covering, an essential oil, very useful in medicine, is extracted from it.

THE CITRON TREE.

THIS tree is very common in Italy, and still more so in Spain and Portugal. It always preserves its verdure, and almost always at the same time bears flowers, green fruits, fruits half ripe, and others entirely so; so that these latter fall from the tree, while the others are ripening.

The citron is as valuable to us as the orange tree, and it is doubtful whether or not the excellent juice of its fruits gives it not the preference. There are several kinds of citrons; some round, others of a lengthened shape; some a little pointed; but all of them have a rough and uneven peel, some of them weigh no less than six pounds; others only a few ounces.

The best citrons grow in Italy, and particularly in a district of the grand duchy of Tuscany, in a plain between the cities of Pisa and Leghorn: But in Sardinia and Spain, they are produced in the greatest abundance, where they sell so low as two for a farthing, when the season has been favourable. When they are intended to be sent into distant countries, they are gathered before they are quite ripe, and while they are still of a green colour, instead of being yellow as you know they are; they are then packed in boxes

to the number of six or eight, and even sometimes of fifteen hundred.

Every part of the citron is useful for something, the peel, the pulp, the very seeds, whether for cookery or medicine. An odoriferous essential oil, which is called the oil, or essence of citron, is extracted from the peel, of which is also made a confection, which I suppose you are acquainted with. A very wholesome and agreeable drink is made by mixing the juice of the citron with sugar and water, which is called *lemonade* in Italy, the citron there going by the name of *limonia*. The citron tree was first brought from Medina, a kingdom in Asia, now belonging to the Turks.

THE ORANGE TREE.

THE orange tree also comes from Asia, but from a different kingdom, viz. from China; from whence the Portuguese transplanted it into their own country. At Lisbon, the first tree of this sort is preserved, from which all our own orange trees, and all those which are in Europe, have been derived. They almost entirely resemble the citron tree. There are two kinds of oranges; the sweet and the bitter.

The largest and the most beautiful oranges which we know of, are those of China; but Portugal produces these fruits in the greatest abundance. In the Indies, there is a species of them of a delicious taste: they are of a red colour, even within the peel, and their juice is such an agreeable acid, that no fruit is equally refreshing in that hot country. The best species, however, and the largest is that of India, known by the name of *pompelmont*;

pompelmont; these oranges are often larger than a man's head, and have an exquisite taste.

The sweet orange is much used in summer; a drink, like lemonade, called *orangeade*, is made with the juice of the bitter orange. The peel of both is preserved with sugar, and great quantities of it are sold.

THE FIG TREE.

THAT which you see bears at the same time ripe fruits, and such as are only half so. It is a tree which, in the southern parts of Europe, and in other countries equally warm, grows in the open field; and to a much greater size, than in those countries where the winter is longer, and more rigorous. Fig trees do not all produce fruits of the same shape; some yield long figs, others round; some small, and others large; some white or yellow, and others a dark violet. All these kinds of figs are wholesome, and have a good taste, although the milky juice of the wood on which they grow be tart and unpleasant. They are dried in great quantities, packed up in boxes, and thus sent to other countries.

In Egypt, and in Palestine, very large figs are produced; but the most singular species, called *Nopal* or *Opuntia*, is found in America. This tree has leaves, instead of branches, which grow at the end of each other, quite round the trunk, green, two fingers thick, and from which the fruits or figs proceed, different from ours in shape and still more in colour, which is red. This tree nourishes an insect called *Cochenille*, which furnishes us with a beautiful scarlet dye; and the Americans also use the juice of this fruit to dye red.

M. Pray, do you remember the story in the Bible, which we were reading some time ago, where our first parents, *Adam* and *Eve*, are mentioned, and also the leaves of the fig tree?

P. Ah! yes, Sir; they clothed themselves with the leaves of the fig tree, because they were naked; is it not so?

M. Precisely: but, although the leaves of this fig tree which you see are larger than those of other trees, do you believe that it would be an easy matter to make a suit of them?

P. It would be necessary to sew them together, as the tailors do; but that would not last so long as cloth.

M. Oh! that would not be attended with great inconvenience; for new suits would easily be obtained. But there is a kind of fig tree, or at least a plant, which is called the *fig tree of Adam*, or *Pisang*, or *Banana* tree, which shoots forth leaves as large as a room door, so that two are sufficient to cover a man entirely; and we may believe that our first parents made use of them. Besides, the banana produces a large oblong fruit like our cucumbers, which tastes like the best figs; but this vegetable is less a tree than a kind of great reed, where we see neither wood nor bark, but only several *envelopes*, the one above the other, and nothing in the middle. The Americans cut out the leaves in the form of dishes, and use them as such, so that at every meal they make themselves new ones. Whenever it has once produced its fruits, this reed dies, and it sends forth a new one from the root, which is a kind of large onion, in less than fifteen months.

P. That is a very strange reed; but have we none of them in this country?

M. They have been raised in some gardens in Europe,

Europe, even in cold countries, and they have yielded fruit; but it evidently would be too difficult to multiply them to advantage, owing to the care and expence which it would require to rear them in our climates. Hold! there is something which you are well acquainted with.

P. O, yes, it is the elder tree.

THE ELDER TREE

is a very useful shrub, and its bouquets of white flowers are very pleasant. They are followed by small black berries, of which very good soups are made, and a very wholesome syrup is extracted from them. Its flowers are not less useful; several people make a kind of dish of them, with flower, milk, and eggs; they are also used in medicine. The berries are likewise, while green, pickled in vinegar, and salt and water, and afterwards used in place of capers.

THE CAPER TREE.

THIS tree is very frequent in the southern parts of France, in Spain, and in Italy, at least the thorny caper, which is the only one we make use of. There is another which has no thorns, but it is a tree which grows in Arabia, and not a shrub like this. All the advantage we derive from it, is confined to taking the buds before they are blown, and pickling them in vinegar, to use them in our sauces. There are countries, where the want of capers is supplied by the seed of cresses, which grows every where in abundance, without trouble, and has the same taste.

THE

THE POMEGRANATE TREE.

THIS is a small tree, very common in Spain and Italy, and in the south of France. It has thorny branches, and produceth beautiful flowers of a scarlet colour, and afterwards fruits, as large as an orange, of a reddish colour, with a hard peel, filled with agreeable juice, and many seeds. Some pomegranates are sweet and others sour.

THE MYRTLE.

THIS is a very pleasant shrub, with little evergreen leaves, which never fall, and have besides a very sweet smell. It is only planted for pleasure; its flowers, its berries, and its leaves, however, have several useful properties. Its branches were used formerly in mournful or joyous solemnities; at present they are only used in nosegays.

There is another kind called the *bastard myrtle*, which grows more easily than the former in cold climates: it is in particular much cultivated in England.

THE VINE.

HERE you see one of the most useful and most delightful blessings of Providence, and a production, which, after corn, is principally cultivated. Its fruit gratifies thirst and hunger at once: its juice is of delicious taste; and when it grows old, and is changed into wine, it presents us with a strengthening and exhilarating liquor.

The vine is derived from Asia, which is its native

tive country; from which it was brought into Greece and Italy, afterwards into France and Spain, and lastly into England and Germany, and all the countries of the world, where it can be be made to grow.

But the juice of the grape or vine is not of the same quality in all countries. There are very great varieties, as well in the taste as in the strength and colour, according to the qualities of the soil, and even of the district, where the vine is planted. Often a middling or bad wine is produced by the side of the most excellent. In general the warmer the country is the wine possesses the greater sweetness, fire, and vigour; for instance, cape wine, those of Spain, Greek and Tokay wines; but the wines of less warm countries are not to be despised on that account, as Champagne and Rhenish wines. Nay, more, the excellent wine of the cape derives its origin from vines which were produced on the banks of the Rhine.

You know the dried raisins which they sell in the confectionary or grocery shops: these are brought from the Levant, from Italy, and Spain. Those of the Levant are the largest; the smallest are those of Corinth, which come from a vine of a quality peculiar to the islands of Zante and Cephalonia, and others in the Mediterranean; which produce them in such abundance, that in good seasons, they gather upwards of thirteen million pounds weight.

All these raisins are prepared by being exposed to the heat of the sun, and afterwards compactly pressed into barrels to be sent to other countries. But there is also a sort of large grape which grows in Asia, of which the vine is as big as a tree. Its clusters are so very large that a child

child can easily conceal itself behind one, and some of them are found to be so heavy that a man can scarcely carry them.

THE MULBERRY TREE.

THE leaf of this tree is the only food of the silk worm. There are two kinds of it, the black and the white. The leaf of the first is of a deep green, and is only cultivated on account of its blackish berry which is good for eating; the white produces a reddish white mulberry, which has no very pleasant taste, but it is the leaf of this tree which is of a clear green, and tenderer than that of the black, which furnishes us with the silk. This tree grows every where, even in cold climates, without much trouble; and, as the silk worm may also be raised every where, the cultivation of them offers great advantages.

P. Ah! did not you promise to procure us silk worms?

M. I did; but do you know when the leaves must be gathered, when to make the worm come forth, and how it should be reared? for it is not in our country, as in China and in Persia, and in other charming regions of Asia, where the silk worms go of themselves to feed and to work upon the mulberry trees; we must here exert our care and our art in succeeding to procure the silk.

P. Ah! I know how it is done: they are put in a chamber, and then we carry them the leaves, and then —

M. We shall see, we shall see, if you are as able as you say you are. We have got into another kind of garden now.

P.

P. This is the kitchen garden, which the salad and pease and the asparagus come from.

M. Yes, this garden is less brilliant than the other, but without it we would make bad cheer; see what a number of different things for regaling us. Do you know every thing which is in these beds? lettuce, succory, and rampions, which is also found in the fields.

P. Is not this chervil, and this parsley?

M. Yes, and this?

P. What? that which is growing in the corner of the wall, and which resembles parsley.

M. Well, is it not so?

P. Perhaps it is.

M. Take a leaf of each of these two plants and smell them.

P. This one stinks, and the parsley does not.

M. Examine well the leaves and the stem of the hemlock, and of the parsley, as well as the smell and the shape; because the one has often been mistaken for the other, and this *qui pro quo* may occasion death; for the hemlock is a poisonous plant, but is nevertheless used in medicine. Do you know rocket?

P. Yes, there it is.

M. It also goes by the name of garden cresses, to distinguish it from water cresses, which you are also well acquainted with; both of these eat well in sallad, and are very wholesome.

Here we have forests of propt pease, and others; then beans; after that we have garlic, onions, and shalot; again, on the other side, there are carrots, radishes, cellery, and turnip. There are cabbages of all kinds; and, on this side, spinage, leeks, thyme, lavender, &c.

P. So all these things are good for eating; and have we eat of them?

M/

M. I have no doubt of it; but you have not remarked them; now only attend, when a new dish of pot-herbs is served up, and you will soon learn the difference. By the way, I had forgotten to mention to you that this plant, which is garden mint, makes a good tea, which is very healthy.

Let us look on this side, I see horse radish, cucumbers, melons, pumpkins; and, on this side, pine apples, artichokes, asparagus, and liquorice.

HORSE RADISH.

THIS is the ordinary radish which has a reddish skin, and is eaten at breakfast, or with boiled meat. Then there you see the true wild horse radish, but which is also planted in gardens. It is grated, and employed in sauces, and is used with meat, in place of mustard.

THE CUCUMBER.

THIS is a fruit which is used before it arrives at its maturity. It is gathered while still young and green, and pickled in vinegar. There are, however, people who eat it when it is full grown, by way of sallad, cut down into thin slices; but it is not wholesome, and ought to be used sparingly.

THE MELON.

THIS plant, the preceding one, and that which follows, are considered as members of the same family, notwithstanding the prodigious difference
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of their respective tastes. The melon, which we raise with so great care on hot-beds, grows unattended, in the open field, in warm countries; as in Italy, in Spain, and in Hungary, provided the soil be good. It is a delicious fruit; but care must be taken to mark accurately the point of its maturity; and this is not very easily done; for, if the melon be cut a little too soon or too late, it loses much of its goodness. There are many kinds of them; for instance, there are red and white melons, and some green; there are some which are no larger than an orange, and others upwards of twelve pounds weight: they also differ much in the shape, and in the nature of the peel; some are oval, others round, others flattish; some of them are angular; some of them are wrinkled some marbled, with streaks of green, white, &c.

THE PUMPKION OR GOURD.

THESE two fruits are almost always confounded, although their figures have very marked distinctions. The pumpkin grows to a great size; some of them weigh upwards of a hundred pounds, and which a man cannot encircle with his arms; its white pulp has a very agreeable taste, is prepared in different fashions, and its seed is a kind of almond, of a very good flavour.

The gourd grows much more in length than in thickness; and some of them are even three or four feet long. It is also called a *calebash*; and there are three kinds of it, all of which are used as vessels when the rind has become very hard, the pulp is dried up, and when you can hear the loose seeds rattling in the heart of the fruit. There is also another kind, rounder than the rest, which resembles

resembles a jug, and is often used as one for holding wine or other liquids.

THE PINE APPLE.

THIS is one of the most delicious fruits we know, having at once the taste of the best melon and of the richest apricot. It grows upon a stalk two or three feet high; the lower part of which is encircled with leaves; its peel is of the colour of the citron, or of the orange. There are several kinds of them. This precious plant grows spontaneously in South America, in Brazil, in Peru, at Surinam, and in several countries of Africa and of Asia: but with us, and in the rest of Europe, pine apples cannot be raised without the assistance of hot-beds and green-houses.

THE ARTICHOKE.

You know artichokes: They are not unlike to pine apples; and the head, which contains the seeds, is enveloped in thick leaves of a sea green colour, and sometimes reddish. They are thick, pointed, and hard, excepting the lower part, which is soft, and good for eating; as also the bottom, to which they adhere. We have several kinds of them.

LIQUORICE.

WE make use of the roots of this plant only. There are three kinds of it; but only one of them is produced in this kingdom; as also in France, in Italy, and some parts of Germany;

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but there it is much richer; and especially in Spain, from whence is brought the greatest part of that which is sold by grocers and apothecaries. You also know, that it is the juice of the liquorice, thickened by means of fire, which is sold in black sticks covered with laurel leaves.

P. Ah! what is it which smells agreeably on this side here?

M. True, we were going to forget it. It is annis, coriander, fennel, dill, cummin: Here take some of these long seeds. They are all good for eating, and have a good smell, except the Coriander, which has not, until dried. Formerly the whole plant was reckoned poisonous, but that error is now corrected.

P. Ah! Sir, there is the door which leads to the wood; let us go; let us open the gate.

M. Yes, but before arriving at the wood, we must pass the field and the meadow, and must walk along the side of that flowering hedge, all of which are full of things, which we are not acquainted with. We shall consume so much time in examining them, that we do not know when we shall get to the wood. Do you see that great tree? It is a wild chesnut; farther off there is a lime or linden tree; and on that side you see a willow.

THE WILD CHESNUT, AND CHESNUT TREES.

It is a pity, that the fruit of this beautiful wild chesnut is unfit to be eaten, even by animals. It is only cultivated on account of its own beauty and that of its flowers. Nevertheless, when the fruit is grated down, and mixed in water, it furnishes

nishes pretty good food for cattle and poultry. Hair powder and starch are also made of it.

With regard to the true chesnut, it grows in the woods; although it be frequently reared in gardens, and grafted, in order to make the fruit more valuable. It is a very beautiful tree, and its wood is useful in timber-work. It grows of itself in several places in England; and there are whole forests of it in France. Its fruit is prickly, and contains two, three, or four chesnuts, which fall off themselves when they are ripe. This tree is named after a city: called *Castanea*, from whence it was brought to us. It also grows in Sicily, Italy, Spain, and Portugal. In some parts of France they make bread of the fruit.

THE LINDEN, OR LIME TREE.

THIS is a beautiful tree, which is much used in ornamenting public walks. Its wood is very good for joiner-work, and even for sculpture and engraving on wood. There are sometimes made of the bark of young limes, strong ropes for draw wells; and the second bark is also spun, and made into a coarse cloth. The bees find honey on its leaves, which make very good tea.

P. Is it that tea which my mother drinks so often? I have also drunk of it: There were little leaves in the tea pot.

M. These were the leaves of the real tree, called tea, which you have drunk, or rather a decoction of its leaves; but it does not grow in our country.

THE TEA TREE

is a shrub which is cultivated in China, and in Japan, in sufficient abundance to furnish all the rest of the world with its leaves; of which there is annually sent to Europe alone, upwards of ten millions of pounds weight. It was not till the fifteenth century that the Europeans came to the knowledge of it; and, a hundred years after, it was every where so common, and so universally used, that, since that time, the Chinese and Japanese, draw an immense revenue from the sale of it. The Europeans at that time, used to land in the province of Fokien, in the kingdom of China, which is situated to the left of the island of Formosa; and as, in that province, that shrub is called tea, it has preserved that name among us; although the Chinese in general, called it *tcha* or *tia*; besides, they superadd the name of the Chinese province, from which each kind has been brought, to distinguish them, especially if the one sort be better than the other.

The goodness of the tea depends on the manner in which, and the time when the leaves have been gathered, and the way in which they have been dried. This shrub usually attains in the space of seven years, the height of a man, and the thickness of the human arm. It has many branches, and its leaves which resemble those of the sour cherry, are always green. It flourishes in Autumn, and shortly after the flourishing, there appears a small fruit, like a hazel nut, of a bitter taste which is not eaten. While the leaves are still fresh, they have no smell, but when you chew them

them they have a bitter taste, almost nauseous, but in consequence of being toasted on a hot plate of iron, they lose their bitterness and acquire an agreeable smell, and a taste slightly aromatic. Thus therefore as soon as they are gathered, they are placed upon a hot plate of polished iron, and while they are still warm, they are rolled with the hand upon matts to preserve them.

The leaves are never plucked from the tree sooner than the third year, as in that time its crop is not only the best in point of quality but also in abundance. They are gathered one by one with the greatest care, twice or thrice in the year. Towards the end of February, or beginning of March, the shrubs are visited daily, and all the young leaves are plucked as soon as they appear. This is the best tea. With regard to the imperial tea, which is more precious than any other, it is made of the buds just opening, which appear at the end of the branches, — and is reserved for the Emperor of China, or his greatest Lords, and for the Emperor of Japan. It is said, that when a Doctor Kœmpfer, a German, was in the Court of this last prince, they presented him with imperial tea, and the person who served it, observed, that each cup cost an itziba, (a square piece of gold worth half a guinea.)

The second crop or gathering, which with most people is the first, begins a month after, that is about the end of March, or beginning of April, when the leaves are almost all out, and well displayed. The third and last, which is the most abundant, takes place a month later still, and then the leaves are both larger and in greater quantity. Each time, the smallest and most tender leaves are made choice of, and that the

tea may have all its delicacy, it is necessary, that after being toasted, it should be preserved a year. But it loses much of its quality by length of carriage, whether by sea or land, after which, it cannot even be drunk without sugar, which the Chinese never infuse in it.

Indeed, we might dispense with tea, if we did not pay so much attention to the fashion and the tales of merchants, who are interested in selling us at a high price, a useless leaf, which comes from a very distant country. We have a number of sweet aromatic plants, which would furnish us with a drink quite as agreeable, and certainly at least as wholesome. Such are the violet, iris, the flowers of the lime tree, mint and sage, which last, the Hollanders praise highly to the Indians; to whom they sell a great quantity of it; even the Chinese, who sell us theirs, are greatly pleased with our leaves.

THE WILLOW.

To return, from this digression, to our willow, which you see there, it is a very common and very useful tree, growing every where on the banks of rivers and lakes, and in moist and marshy places. There are several species; and in particular, two general divisions; the brittle, which preserve the name of willow or sallow, and those which are pliant, which are called oziers; of which some, as the great red ozier, grow also in dry and elevated situations. The flowers of this tree appear a long time before the leaves, and present the earliest food for bees. There are some kinds which furnish a species of very fine cotton, which may be spun
and

and employed for different purposes. It may also be used in making paper. Some of them are green, others yellow, red and white; some of them have narrow leaves, others broad leaves, some green, others whitish. To produce a willow, it suffices to plant a branch in the earth. You have surely seen those old hollow willows, which have nothing of the trunk remaining, but the bark, and which nevertheless produce leaves.

P. Oh! very often; but what has made them become hollow?

M. It is very clear, that it must have been occasioned by the rain, which lies on the top of the trunk, (for you see that that part of the trunk is very broad) so that the water penetrates by degrees into the wood, which is very tender and spongy, and causes it at length to rot; after which, nothing more than the bark remains, and a little of the wood half rotten within.

P. But it is a singular thing, that the leaves, and also little branches grow on these trees, when there is no pith. Is it not true, that the pith makes the trees grow?

M. Have you seen trees growing without bark?

P. You said formerly, that when the bark was taken entirely from a tree, it would necessarily perish.

M. That has been tried several times; but you have seen trees without pith, producing leaves, since there is the willow in that predicament. But what would you say if the head of a tree was planted in the earth, and the roots exposed to the air; and if the uncovered roots should become branches and produce leaves, while

while the former branches, now under ground, should become roots?

P. Ah! is that possible?

M. It is a thing which has been tried with a lime, and which has succeeded. Thus you see, that the branches and the roots of a tree are of the same nature.

P. Ah! how I wish to see that tried.

M. We may do it when we have time, and we shall learn many other things not less singular; especially respecting the properties of trees which are produced in foreign countries, which are so different from ours. Hold—I will name you a few of those which furnish us with things which you know. For instance, the nutmeg, the the cinnamon, cloves, and rhubarb.

RHUBARB

is a plant, which comes from China, in Asia, although it has since been found in Russian Tartary, and even higher up in Siberia. For a long time we knew nothing of it but the use; at length a plant was procured, and it is now cultivated with success. It has a thick long root, the only part which is chiefly used, and that only in medicine. It is very efficacious in promoting the evacuation of bilious humours, and strengthening the stomach.

THE NUTMEG TREE.

THIS is as large as an apple tree, of a spongy substance, which produces fruits somewhat like our peaches, but of a very different nature. The
flowers

flowers do not appear all at once, as in our fruit trees, but a long time after each other, in such a manner, that we see at once upon the tree, flowers and fruits, some ripe, others green; and there are generally three crops in a year. Each fruit, or nutmeg, is covered with three coats; when it is ripe, the exterior one opens itself and falls off; sometimes alone, sometimes with the nut, and the second coat; it is improperly called flower of nutmeg, and is pulpy and good for eating. The second coat is nothing but a thin skin, of a yellow colour, which is carefully peeled from the nut, and dried by itself. After that, is found the woody shell, which immediately covers the precious nut, of which we make so much use. The hard shell is good for nothing, but the yellow skin is, and is called mace. They bury the first coat in the earth, that it may become putrid; from which there springs a kind of mushroom, which is highly esteemed in the country. For a long time, it was believed, that the nutmeg tree only existed in the isles of Banda in the East Indies, belonging to the Dutch, where indeed these trees grow in the greatest quantity, but they have since been found in several other Asiatic islands. They might be much cheaper, as well as cloves and cinnamon, if the Dutch, in order to sell them always dear, did not burn great quantities of them in those years, when they think they are too abundant.

THE CLOVE TREE.

THIS tree is as large as our cherry trees, and is chiefly produced in two of the Mollucca islands,

slands, Amboina and Ternate, belonging to the Dutch. They have lately been planted in several other places, and succeed pretty well. The part which we use is the bud, inclosing the flower, and the embryo of the fruit, and which is gathered and dried before it opens. The manner of drying and hardening them is by exposing them to smoke upon hurdles, for several days, and afterwards to the sun for a considerable time. The fruit, when arrived at maturity, has not so much efficacy as the bud; and is not made so much use of in cookery; although it be preserved in sugar, and eaten to strengthen the stomach.

THE CINNAMON TREE.

THE Cinnamon tree is about the size of a pear tree, and only grows in the island of Ceylon; which the Dutch have been long in possession of; and as the tree grew in a few other places only, they used every method, and at last accomplished the purpose of extirpating all other Cinnamon trees; so that now they have ingrossed the whole of them which are all concentrated in the space of fourteen leagues. It is the bark of this tree, which we use under the name of cinnamon, that is the second or interior bark, which is cut in long stripes, and dried in the sun; in the drying, the pieces roll themselves up in the shape of pipes, as we see them. It is very useful in medicine, and in cookery; but every part of the tree is also valuable; roots, trunk, stems, leaves, flowers, and fruits, are all serviceable; affording extracts of precious oils, odoriferous waters,

ters, volatile salts, &c. It is an excellent tree.

P. Oh! if we had one.

M. That may be in time; but can you guess how this fine white cotton, of which your vests and stockings are made, is produced?

P. You have said, that cotton grows on a kind of willow.

M. That also is a kind, but not real cotton—
Listen—

THE COTTON TREE.

THE cotton tree grows in the Indies; and particularly in the American islands. It is from eight to ten feet high, and has a very tufted head. It bears a flower which resembles a bell, of a single piece, or as it is called, mono-petalous; but cleft down to the bottom in five or six divisions. Afterwards, there is produced a kind of nut, which incloses the cotton attached to the seeds of the tree. This tree is always multiplied by means of its seeds, and never planted; every branch is cut off when it has produced its cotton; and every third year, the trunk itself is cut close by the ground, that new shoots may be produced, without which, the tree would not last; and the cotton also thereby becomes finer, and more beautiful. There are two crops every year, one in September and October, the other in March. Mills are employed to separate the seed; after which, the cotton is packed up in sacks of strong coarse cloth, well moistened and strongly compressed.

There

There is another kind of cotton, which is produced neither from a tree nor a shrub, but a kind of herbaceous plant, which is sown every year. It is cultivated in China, in Asia, and in Italy, &c. This plant grows to the height of two or three feet, bears yellow flowers, which are succeeded by oblong nuts, sometimes as large as eggs, which ripen in the course of a few weeks. There are generally from fifteen to twenty on each plant, in which the cotton is so much interwoven with the seeds, that it is very difficult to separate them. Varieties of this plant are also cultivated in the islands of Candia, Lemnos, Cyprus, and Malta, &c.: all of which have their particular qualities; for instance, that of Cyprus is white, soft, and long. That of Corsica is finer and longer, whilst that of Malta is the finest and the best. The cotton plant is sown in the spring, and is gathered in autumn.

THE PEPPER PLANT.

There are a great number of plants, the fruit of which, we call pepper; which name has been given them, without doubt, because they are all in a certain measure, of a strong smell, and of a burning hot taste; for in other respects, they differ extremely in shape as well as size; some of them are large trees, others are shrubs, more or less high. But the pepper most commonly used among us, resembling blackish peas, is the fruit of a plant, which produces long stems, creeping along the earth, or twisting themselves upon the neighbouring trees. The Dutch bring it to us from the islands of Java and Sumatra. It is also produced in the kingdom

dom of Siam. We likewise get several kinds of pepper from America. In general, pepper is the most burning and destructive kind of spice; and the use of all these things, especially during youth, prepares many infirmities for a more advanced time of life.

GINGER.

THIS is a reddish or whitish kind of root, on the outside, and brown within, which comes from the Indies and America. That of China passes for the best. It shoots forth a kind of reed. It is ground into powder, and mixed with different kinds of victuals.

MANNA.

THIS is a thickened juice, which has the sweetness of honey, and which in Arabia, Calabria, and Sicily, runs from the bark and the leaves of a kind of ash; and while it dries in the sun, assumes the form of little seeds. It runs only in the hottest summer months, June, July, and August. In countries where it is gathered in abundance, it is used in food, instead of sugar; but we use it only in medicine, by way of a purgative. There are several trees which produce a kind of manna, or rather gum; as certain oaks, the cedar, the pine, and the lime tree. There is also a kind of manna, which is produced in France, but of an inferior quality to that of the Levant. It is called manna of Briançon; because it is gathered in

in the greatest quantity hear to that city in Dauphiny.

Since I am now speaking of the juice of trees, which we eat under the name of manna, I shall next mention a tree, the very trunk of which is eaten ; I mean the sago.

THE SAGO TREE.

THERE is a tree in India, especially in the Moluccas, and in Java, of the palm species, growing to the height of forty or sixty feet, and of a considerable thickness. Like other palm trees, it has no branches, but very large leaves ; four feet long, and almost two broad ; which the Indians use for many purposes. The trunk is rough, and covered or divided by knots, which resemble rings. The bark is two fingers thick, which, within, is full of a well tasted, soft pith ; this is reduced to a sort of meal, and when diluted in water, makes very good bread. The meal is sometimes brought to Europe, in the shape of small seeds, toasted by the fire ; and these are, what we know by the name of sago ; of which excellent soups are made. By multiplying this singular tree, the inhabitants of these countries might dispense with sowing corn. They would require nothing else, than the following tree ; although, besides, a very agreeable liquor is extracted from the sago tree.

THE SANTO

is a tree very singular in this respect, that it furnishes sweet water ; and, on that account, the
more

more useful in those countries, where providence has placed it; because there sweet water is very difficult to be come at. Thus, the people of these countries, would have nothing more to do than to be careful in multiplying these species of vegetable fountains, to prevent the evils which accrue from the aridity of the desarts through which they generally wander. The Santo has this singular property, of being unceasingly enveloped in a thick fog; in such a manner, that the water is perpetually dropping from its leaves, and may be received in vessels, and employed for the purposes of life.

POTATOES.

You do not know that this root was brought from America. It was first cultivated in England. Although the potatoe has little taste by itself, yet it assumes any one we wish, and is a wholesome food; whether for men or cattle. A single plant produces from forty to sixty potatoes. They are eaten either boiled or roasted, and are served up in a variety of other fashions. They are even made into bread and hair powder.

Francis Drake, brought this plant to Europe in 1586, to England, his native country; and it is one of the best things which we have received from the new world.

LINT

LINT.

THIS plant has a slender stalk, and never grows higher than two or three feet. Its leaves are narrow and long. Its flowers are blue, from which are produced round husks, filled with broad or flattened seeds. When ripe, it is torn up along with the root and the seeds; but these latter are separated, and collected apart, until the round husks, inclosing the seeds are dried in the sun, and open of themselves. From these seeds lintseed oil is extracted; which is useful for burning, in painting, and fit for a number of other purposes. With regard to the stalk, it is steeped, then dried, beaten, and combed, until ready for spinning, when it is converted into cloth; some of which is exceedingly fine.

HEMP.

THIS also is a plant, which, in the same manner as lint, may be converted into cloth; some of which is fine, but in general it is coarse and strong; and is employed in making tents, sails for ships, &c. The rope makers universally use it: as also the shoemakers. But what is most admirable in hemp, as well as in lint, is, that when every thread of the cloth which they have been used in making, has been worn, torn, and changed into rags, they are not thereby rendered useless: industrious hands can revive them under a new form, not less useful than the first;

first; and these hands are those of the paper makers. They collect these rags in great quantities; then they pick them, clean them, tear them into small pieces, put them in water, in which they pound them with large pestles or hammers, in mills made for the purpose, until they have reduced them all to one thinish pulpy substance; of which they afterwards make paper of every kind. In other distant countries, different kinds of barks are used in the manufacture of paper; for example, the Chinese employ in their country that of the Bamboo cane. In India, those of other trees are used. Our ancestors, before the invention of the art of making paper, wrote on the bark of trees; as also on the leaves of a plant, called papyrus; from which is derived the name of paper. They also used the finest part of the skin of several animals; such as parchment, which we still use on certain occasions.

Paper is not made of the rags of linen alone, but is also drawn from nettles, straw, moss, cotton of willows, and poplars, and from several other materials. All these modes of manufacturing paper, however, would be either too costly, or the paper so manufactured, would be inferior in quality, to what is made in the common way. It is believed, that the manufacture of paper from rags, was begun in the twelfth century; but the Chinese very long before that time, made their paper of cotton; and even in the time of Alexander the Great, the Egyptians used a kind of it which was made from an herbaceous plant.

P. And when the paper is torn down, can men make nothing of it then, as they do of the rags of linen?

M.

M. They have invented a method of deriving some advantage from this also. They reduce it again into a watry substance, and then make pastboard of it.

P. But it is a very singular thing, that any thing should be made of nettles: I imagined, that it was one of those useless herbs which are fit for nothing.

M. There are a number of other plants which are looked upon as useless, but which may one day become of much importance.

THE NETTLE.

THIS plant is so common that its increase is very incommodious; and instead of cultivating it, like many others, we are obliged to destroy it. Nevertheless, it has been found, that neither the great nor the small nettle is by any means useless: People have succeeded in drawing from the great nettle a very fine thread: of which cloth has been made, which is found to be good, and easily whitened. In Germany, muslin of a very fine quality has been made of it. The mode of manufacturing it however, is rather expensive; and on this account the invention has been abandoned; but in some places, they still continue to make lace of it; and particularly pack-thread. Besides, the nettle presents sufficiently good sustenance to several animals; its flowers, its seed, its juice, the whole plant in short, furnishes the physicians with several remedies.

THE

THE ASBESTOS OR AMIANTUS.

AND what would you say if I should tell you of a cloth made of a stone, or of a cloth which is thrown in the fire to whiten it when it is dirty? nay, you need not laugh, the thing is true. This stone has been called, incombustible lint, which is the reason, that in speaking of lint, it struck me to mention it, although at present, we be in quest of plants, and not of stones. The true name of this stone or fossil, is Amiantus; and there is a harder and heavier kind of it, which is called Asbestos. This stone in general is very soft, being in fact composed of certain parcels of threads or filaments, which may be separated from each other with warm water, so that thereafter a kind of cloth may be formed from the thread; but you may well believe, that the making of such cloth must be attended with great expence; so that it is only princes and great lords, who are able to procure a few napkins of it. Nevertheless, in several countries, and particularly in France, in Languedoc, and Roussillon, many people have cords and garters of Amiantus, which they throw in the fire when they are dirty, instead of giving them out to be washed.

P. Oh! how convenient that would be, if all our linens were made of that stuff.

M. We should have no occasion for washerwomen, but the cloth of Amiantus always loses a little of its weight every time it passes through the fire. Formerly it was almost an indispensable requisite, in performing a certain ceremony, and every person who was able, did not fail to procure

procure a sufficient quantity of it to make a winding-sheet. For in those times, it was not customary to bury the dead, but their bodies were burned, and afterwards their ashes carefully collected for the purpose of piously preserving them in urns, or great vases. Thus, to prevent these ashes from intermixing with those of the wood, an excellent method was discovered, which was to wrap up the dead body in a large cloth of Amiantus.

But let us return to the plants which we have under our eyes.

MAIZE OR TURKEY OR INDIAN CORN.

THIS plant grows like a kind of reed; having large leaves, very broad and very long; its ears are sometimes a foot long, and thick in proportion; so that although the grains be as large as a pea, every ear contains several hundreds of them, closely pressed together, in parallell lines,—sometimes to the number of seven hundred. Every stem of maiz, when well cultivated, produces three ears. There are different kinds of it, the red, the blue, the violet, yellow, and white. It is very useful as food both for men and cattle; the rich have also found out a method of appropriating it to their delicate taste; but always according to their ruinous, pernicious, and destructive method, that is, by cutting out the ears when they are young, and making them into a confect; in which state, they are enabled to consume all the six or seven hundred grains at one mouthful. They would do better in continuing their endeavours to extract sugar from it. A syrup has already been extracted from

from it, which has a great resemblance to that of the sugar cane.

P. But what is that sugar cane?

M. How! do you not know that sugar is only the juice of the pith of a cane or reed?

THE SUGAR CANE.

THIS precious plant is also called cannamel, which is as much as to say, honey reed, and in fact, it is a true reed which grows nine or ten feet high, two fingers thick, and is encircled with knots, at the distance of four or five fingers from each other. From each of these, a leaf is produced, which falls as the cane ripens, and when it is completely ripe, it is cut down and pressed under rollers, to squeeze out the juice; which is instantly boiled, lest it should turn sour. When it is sufficiently boiled, it is poured out into pointed moulds, where the loaves assume the form in which we see them; afterwards, the sugar is whitened and purified; for while it is boiling, it has nearly the colour of honey. It is sent to us after being boiled, from America, and then we refine it by different methods in our sugar houses

The sugar cane is also cultivated in Asia, in Africa, in Spain, in the kingdoms Naples and of Sicily; but the greatest quantity comes from America. Indeed, independent of the sugar, which comes from foreign countries, we have a kind among ourselves, perfectly formed. Do you not love honey? It is true, that if pains were taken to harden it, it would become more expensive, at least bee hives would require to be greatly increased. But besides that, we have also the resource

source of skirret, the mapple tree, and many other plants. If the sugar of America was to fail, necessity would make us discover modes of extracting all these sugars, in a simpler and and less expensive way, than the experiments which have been made. To conclude, sugar is a very good thing, when is is not used to excess; and since our Creator has made us this present, why should we not enjoy it? I say, however, that we might dispense with sugar, as our ancestors did before it was discovered; they then made use of honey, and you see that we might still have it by other means. Indeed our ancestors enjoyed good health without it, and perhaps better than all our great eaters of sugar, and drinkers of coffee; for coffee was as little known to them then as sugar, and nevertheless, we see that there were fewer diseases among them then, than in these days.

P. Does not coffee then grow in our country?

M. Truly it is produced, very far from this.

THE COFFEE TREE.

FORMERLY coffee only grew in Arabia. It was carried into Italy, by the Venetians in 1624; from thence into France; from whence it has found its way into many other parts of the globe: in particular, it is much cultivated in America. This tree never becomes thicker than a man's leg, yet rises in its native country to the height of more than forty feet; but in other countries it seldom exceeds the half of that height. Its leaves resemble those of the citron tree, and do not fall all at once, but it bears almost always at the same time, leaves, flowers and fruits.

These

These last are attached to a little stalk, and inclosed in a shell two by two, which is itself inclosed in a kind of cherry of a pale red, when it is ripe; it is gathered, two or, three times each year.

The best coffee is that of Arabia; after which, that from other quarters of the Levant is principally esteemed. The coffee of the isle of Bourbon in Africa, near the island of Madagascar holds the next rank; and lastly, that which is brought from America; of which the best sort grows in the island of Martinico.

But we have also resources, if we should ever wish to dispense with the use of coffee, while at the same time, we inclined to have a drink made of toasted substances. For wheat, barley, and rye furnish us with one, which is no less useful and agreeable. We may also add the root of succory, and several others, which we need not go far in quest of, as that which you see there —

P. Oh! that is what my mother gives the linnet, which we have at home.

MILLET.

M. The plant as well as its seeds are very small; but every ear contains five or six hundred of them. There is another kind which is very large, and grows to the height of eight or ten feet; its seeds also are large; it grows in Africa, and is also successfully cultivated in Europe.

THIS

WHEAT.

THIS is a plant, which also produces ears, but of a different shape from those of millet, and containing fewer grains; for there are never more than forty or at the most fifty. These grains are separated from the ear by the flail; afterwards it is ground and reduced into flower. In short, it affords us daily nourishment and what comes in place of every other viz. bread. A variety of other dishes are made of it; particularly all kinds of pastry; besides, as I have already said, the grains may be toasted, and used instead of coffee. The straw also is converted to several uses.

RYE.

THIS is another species of corn of which the stalk and the ear are longer than those of wheat. The meal of the rye makes a kind of bread, of a very good taste, but it is rarely employed for other purposes. Its grain when distilled produces a strong liquor. The straw of rye is better than any other, and is put to a great many different uses.

BARLEY.

THIS also is a kind of grain, the utility of which is infinite. It makes excellent beer; and a variety of strong spirits are distilled from it. The same advantages are drawn from oats; which,

which, besides, are the best food for horses. With regard to lentiles and peas, they are generally used by man; but vetches are given to the cattle.

P. Ah! now we have got to the wood.

M. Yes, we are about to enter the garden of our master.

P. What do you mean by the garden of our master?

M. Look back, and tell me what you see. Do you not see fields sown with corn, houses and gardens; hedges, fruit trees, and a number of other things? so that, there is not an inch of ground, which man has not cultivated, nothing which has not been formed by him, or ornamented by his industry. On this side again, tell me what is presented to you?

P. Nothing but trees.

M. That is to say, a garden, where neither the works of man, nor the impression of his industry appear. Thus, it is the work of the Creator alone. It is he alone, who has sown and planted these trees, which shelter us from the heat of the sun, and these herbs and flowers, which display such a beautiful carpet for our feet. Is it not then the garden of our master which we enter? Hear how these little winged musicians receive us, when we incline to come to enjoy his benefits, and admire his works.

P. What is this under which we are? what sort of nuts are these which grow upon it?

M. These are acorns.

D

THE

THE OAK.

THEY grow upon this tree, and furnish good food for the hogs which are fed in the woods ; but in cases of necessity, we might discover methods of living upon acorns. Several people toast them like coffee, and extract from them a drink of the same sort. But the wood of the oak is more useful than its fruit. Indeed, it can scarcely be dispensed with in the timber-work of any considerable building ; and still less in the construction of ships, or other erections in the water. Joiners and turners also use it ; and what is not fit for their purposes, makes good fires.

P. Ah ! what nuts are these above us ?

M. They are called nuts truly, but they are galls. Of these many are brought from the Levant, and from Arabia, which are much more useful than ours in painting, and in making ink. Now, I must tell you how this nut is formed upon trees, without being the fruit of them. There are a sort of flies, which make with their sting, a small hole in a leaf, or in the tender bark of a young branch, wherein they deposit one or several eggs. Then the sap of the wood escaping by this little hole, and hardening in the air, forms round the egg, that excrescence which resembles a small nut. In the mean time, the egg opens, and a small worm is produced, which remains there, and nourishes itself with the sap, until it comes out of its shell, under the form of a fly or gnat. Thus it happens, that these gall-nuts are always pierced, when they are gathered late in the season ; and contain an insect,

sect, if opened when green. If you ever hear the gall insect talked of, you must not imagine it to be that insect, which by its puncture, causes the formation of the gall nut. The gall insect, is in fact, pretty like a gall nut, when it is seen upon the tree; but it is a true insect of that size, which remains there as long as it lives, adhering to the leaves, of which it sucks the juice, and depositing its eggs, which remain under its body when it is dead.

THE BEECH TREE.

THE wood of the beech is the best of all for burning; and its ashes make an excellent lye for cleaning linen. An infinity of utensils, as tables, and different kinds of vessels, the poles of carriages, troughs, wheels, &c. are made of this wood. Its small triangular fruit, which is called beech-mast, has a taste somewhat like the nut. Very good oil is extracted from it; besides, it serves instead of acorns to fatten hogs.

THE FIR TREE.

THIS is one of the largest of that kind of trees; the leaves of which resemble a needle; such as the pine, the yew, the cedar, the juniper, &c. and which preserve their foliage in a verdant state in every season; while the other kinds remain stripped of them during the winter, altho' this is not the case in warm countries, as there trees of every sort, when they lose their leaves,

do not however remain naked; because they bud and put forth new leaves at the same time. All these trees grow to a very lofty height, except the juniper, which is only a shrub. There are some pines and firs, which are eighty and even a hundred feet high; the trunk of which, cannot be encompassed by two men. Their bark is sometimes reddish, sometimes brown, sometimes of a blackish colour, sometimes of a whitish. Their wood is resinous, and their seeds are inclosed, and stick together in the form of a cone or pyramid. These seeds are ripe in October, or November, but they do not fall till the month of May following, and soon produce a number of young trees.

The common fir has its foliage formed of green, solitary soft prickles. Its bark is brown or blackish. It multiplies abundantly, in northern countries; but does not thrive well in warmer climates. These trees are found to exceed four, five, and six feet in diameter, and more than a hundred feet in height. They are good for making large beams, planks, and masts of ships. In Lapland, they make baskets and ropes with their long roots. Rosin, pitch, &c. are extracted from it. There is also a white fir with a smooth bark, which furnishes a liquid rosin, called turpentine.

THE CEDAR.

THIS tree, otherwise called cedar of Lebanon, which is a mountain of Syria, where it formerly grew, is of the same species. Its bark is of a dark ash colour. Its wood reddish and odoriferous. Its leaves, like those of the juniper, are collected

collected in parcels, like those of the larch. This was a tree highly celebrated in ancient times, on account of the excellence of its wood, which passed for incorruptible, and exhales a pleasant smell. On this account, it is much extolled in ancient books, and among others, in the bible; where we see that Solomon, the king of the Jews, received a great quantity of it from Hiram, king of Tyre, to build his temple.

THE LARCH.

THE sharp leaves of this tree grow collected together in dozens, round a common pedicle, and form little parcels round the branches. The larch exhales in spring a very good smell, and from its trunk a strong clear rosin trickles down, also named turpentine, and which is used in medicine. Much greater quantities of it are extracted by making a hole in the trunk of the tree, a foot or two above the earth. Its wood is very good for building ships and for constructions in water. —

The resinous juice of all these trees is of great utility. From them is extracted that pitch which is used by shoemakers, coopers, &c.

The pine tree produces tar, with which ships are covered without and within; as are also cables and the nets of fishermen, to warrant them against rottenness, and render them more durable.

THE

THE PINE TREE

Resembles the common fir, but its leaves are longer and narrower. This resinous tree grows more readily, and straighter than any other, and becomes very large. Beams and planks are made of its wood, which is so full of rosin, that even while quite green and fresh cut, it takes fire like a match, and in many places is used to kindle fires. The soot which is collected in the furnaces, where these resinous woods are burned, and where pitch and tar are made, forms what is called lamp-black: it is used in making printers' ink, and is of service to painters, shoemakers, masons, and several other artisans.

There is another tree of this kind as large as a pine, and having the appearance of it; but its leaves are much longer; besides, its fruits are inclosed in a thick and hard shell, each of which contain twenty seeds, which are eatable. This tree is very common in Italy and in Spain.

P. Ah! what a number of strawberries and mulberries!

M. These mulberries are not the true fruit of the mulberry tree, but a different species, which grow wild. What do you call these?

P. These are raspberries. I thought they had been produced only in gardens.—

M. Not at all: the raspberry bush grows wild.

P. Ah! I have trampled on something—but there are others of them. Look, what is that, which resembles an umbrella.

THE

THE MUSHROOM.

It is a kind of mushroom; the head of which is brown, convex, and smooth above; white and leaved beneath. There are a great number of species of them, which all grow in moist places, and are produced from rotten substances, as the trunk of old trees, &c. for the most part with an extraordinary quickness. Some are of a soft juicy substance, and last a short time: others which last longer are dry and hard. They have hardly any root; and their seeds for the most part are not visible without a microscope. Several kinds of them are eatable; but in general, they are poisonous, and the very best kinds of them are not altogether wholesome; especially such as are produced on dunghills, and in marshy places; besides, if there are several of them which are quite harmless, they are not easily distinguished; and it is certain, that the most fatal accidents, and even death itself, has been occasioned by eating them; and if in some countries, where they are less noxious than in ours, people eat them commonly; that is no example for us to follow; besides, we would not be deprived of great pleasure by abstaining from eating mushrooms; for the best of them are a very dry and very insipid food.

THE TRUFFLE.

TRUFFLES are also ranked among the different species of mushrooms; but they have not yet

yet been discovered to be hurtful. The only question hitherto undecided regards their taste. For while some people highly esteem the good smell and good taste of truffles, there are many who contend that they possess neither the one nor the other. There is this remarkable difference betwixt the truffle and the mushroom, that the former is found under the earth, and in order to discover those places where they are, people lead out the hogs to feed, which as they are fond of them, and smell them under the earth, instantly set themselves a digging, with expressions of the greatest joy. Then they drive them away, and dig for the truffles, which are sold very dear. People sometimes also go in quest of truffles with dogs. They almost resemble potatoes. Some are small, and others so large as to weigh six or eight pounds.

P. But look there; what trees are these, on which that grass is growing? They are almost green. Is it the same with the grass in the meadows?

MOSS.

M. It is moss. There is a vast variety of species of it. It is a plant which has roots, and a sort of leaves which most frequently are green, but sometimes also yellowish or whitish, growing, as you see, on trees, on the earth, and on all kinds of substances which grow old; even upon stones. It hurts those trees to which it attaches itself; because it robs them of a great part of their sap; and, besides, it retains the water of showers and of mists; which causes the bark to rot; so that a tree covered with moss produces
few

few fruits, and those of a bad quality. Sometimes it even dies. It also hurts the meadows; because it occupies the place of grass, and prevents it from growing.

MOULDINESS.

BUT there are species of moss, which must truly astonish you, you have often seen mouldiness on old crusts of bread, on old fruits, on orange and citron peel, or on the old covers of books, which you paid little attention to. All these patches of mouldiness, however, are so many mosses; or rather true meadows where we see plants with their flowers, their stalks, and their roots: often even animals, of an extremely small description, are seen moving in them; but I must shew you all this with a microscope; without which, I am afraid you will not believe me. This shall be one of our amusements, when the weather prevents us from going abroad. All these plants cannot spring from putrefaction, as you may suppose, but from real seeds. Thus, you see how the Creator can give life to beings so small, that we can scarcely see them, and to others so great that we are astonished by their enormous size.

P. What is that which resembles a piece of leather, and which also grows upon the tree?

AGARIC.

M. You see how difficult it is, to recognize in their natural state, those things which art has disfigured. You have seen tinder or *Amadou* a hundred times, and yet you do not know it. It is true that it requires some preparation to make tinder with an agaric, like that which you see. The agaric is a kind of mushroom, which

grows on old trees, even when cut down ; for instance, on old barrels in the cellar. The agaric has a very precious and very useful property, which I would have you to remember in times of need ; for example, if you have accidentally cut yourself, you have only to apply a piece of agaric to the wound, which will instantly stop the blood ; and almost all the apothecaries have agaric prepared for the purpose.

P. Shall we also find sponges in the wood, such as we have at home, to wash with ?

M. Sponges are produced in the sea. They are neither mushrooms nor any other species of plants ; but they are a kind of shells, or hives rather, in which small animals, of the *Polypus* kind, are lodged. But we must take another time to acquaint you with these other miracles of nature. In the mean time, let us talk of this little shrub, with the prickly leaf.

THE JUNIPER.

THIS shrub presents us the appearance, that the greatest part of trees do in warm countries ; in this respect, that, besides the faculty of remaining green winter and summer, it bears almost in every season, ripe and unripe berries at the same time. Its berries, which are black, are used in some countries to season dishes. Other people make a very agreeable syrup of them ; but they are chiefly used in the composition of that strong spirit, which derives its name from them, and is called gin.

P. Ah ! there is a fine wild rose.

M. The proper name of that is eglantine. I suppose you did not know, when you plucked its

its simple pretty flower, which has so sweet a smell, that it had so fine a name.

THE CANE OR THE REED.

You see that this is an aquatic plant. There are several kinds of them. In general, they are divided into two sorts, viz. Those which are hollow, which retain more particularly, the name of reed; and those which are not, which are called canes. Of this last kind, many are brought from India: the pith of which grows as hard as wood. They are sold very dear, and make excellent walking canes.

SHAVE GRASS OR HORSE TAIL.

THIS plant is ranked as a species of reed; because it is jointed and hollow. It is called horse tail; because it somewhat resembles one. The chief utility of this plant consists in its being fit for polishing tin, and kitchen-furniture. It is likewise sometimes used in medicine; and also for feeding cattle; but only when it is dry.

Do you see that field all clothed with verdure? I wager that you cannot guess what it is.

TOBACCO.

You have seen it, however, very frequently, perhaps ten times a-day, but in another state.

P. Is it good for eating?

M. It is neither good for eating nor for drinking,

ing, nor for men, nor for cattle. The physicians, at the most, make some use of it in certain cases; and, nevertheless, there is no plant, excepting corn, which is so much used by the poor and by the rich: it may even be said, that the use of it is more general than that of wine; seeing that numbers of poor people who can very rarely afford to taste of the juice of the grape, have the misfortune to be totally unable to dispense with tobacco; although it is good for nothing at all but to hurt them.

P. Is all that tobacco? I have often heard my mother say, that she wished from her heart that she had never touched it, or could do without it.

M. There are few smokers or snuffers who do not say as much; because the use of it subjects them to a very great slavery; and at the end of the reckoning, we see no good result from it, excepting much profit to those who sell it. I have seen some people, who could never accustom themselves to it; because they did not think they were obliged to obey the fashion, so far as to sustain the very disagreeable impressions, which the snuff or smoke of tobacco makes upon beginners. The generality of people, however, as you see, resolve to undergo this voluntary punishment, to appear like their neighbours. They consider themselves well indemnified by the pleasure of displaying a snuff box in company, or sitting gravely with a pipe in their mouth, at the expence of much inconvenience and diseases (which are often attributed to other causes); beside, the disgusting nastiness which results from it, which no care can prevent. It is said, that the use of tobacco, is at least beneficial to people subject to a superabundance

dance of humours, by daily causing the superflux to evacuate by the mouth or by the nose; but this is false: that is to say, the use of tobacco procures an evacuation of humours; but instead of destroying the cause of the evil, as a remedy ought to do, it augments, and perpetually provokes the formation of new superfluous humours; of consequence if there are cases, where tobacco may be employed as a remedy, they must be of a different nature and less frequent.

P. But is it long since tobacco was used?

M. It is nearly three centuries since it was brought by the Spaniards from the island of Tobago in America, and people had lived in preceding ages without the knowledge of this plant. It is true, we ought not to despise a good thing, which we become acquainted with to-day; because we knew it not yesterday; but the real utility of a thing, is the criterion by which we must esteem it.

There are several species of tobacco, and in warmer countries, it is much larger than that which you see. As this plant is cultivated only for the leaves, its head is cut to prevent it from flourishing, which makes them increase, and as little as possible is left for seed. It is reared in Europe, but much more in America; from whence several hundred of vessels arrive annually, loaded with it.

CUMMIN AND CARAWAY.

These are two plants nearly of the same nature, the grains of which, however, are different,

ent. They have a good and strong smell, and an aromatic taste, which renders them useful in cookery, as well as in medicine. The cummin has oblong seeds; those of the caraway are convex on one side, and concave on the other. The Dutch mix them with their cheeses; and the Germans put many of them in their bread. The seeds are very wholesome.

The cammamil and the milfil, which we find under our feet, make a very wholesome and well tasted tea. There also you see on every side, a variety of plants, of herbs and of simples, which present us with remedies of every description.

WOAD.

THIS plant is cultivated in the fields by itself, as corn, turnip, and others: although it is only used as a blue dye. The leaves of it are gathered for this purpose, two or three times every summer. They are pounded and reduced to a paste, which is made into balls, and sold to dyers; who extract a fine colour from them.

MADDER.

THIS also is a plant serviceable in dying. The colour it furnishes is red, which is extracted from its roots, when dried and reduced to powder: although it has been found, that when used fresh, the half of it might be spared. The rest of the plant affords good nourishment to cattle.

SAFFRON.

SAFFRON.

THIS plant is also used in dying. Its colour is a beautiful reddish yellow. It is also used much in medicine, and even in cookery, at least in most countries. It is neither cultivated for its root its stem, its leaves, nor even properly speaking for its flower, but only for a part of the flower, viz. those small fibres which you see in the centre of most part of flowers. This flower is gathered in autumn; but the plant has this singularity, that its leaves do not fall till spring time; and that the flowers only last a day or two; so that it is difficult to collect them. Its root is an onion, which grows in every country, provided that the soil be properly prepared. Saffron however, is sold very dear.

MUSTARD.

THIS plant is very common in the country. It is cultivated for its seed, which is very useful in improving the taste of meat, for those who suppose they have need of it. It is very hot and acrid.

THE SLOE TREE.

THIS thorny shrub grows every where in the country; and is also called the wild plumb. Its flowers are used in pharmacy. Its fruits are eaten when they are black, which seldom happens

pens till the first frosts are past. A vinous liquor is extracted from them, which is very wholesome, and of considerable use among poor people in foreign countries.

HOPS.

THIS is a creeping plant which attaches itself to the neighbouring shrubs, and adorns the bushes with its beautiful garlands; but when cultivated, it becomes more beautiful, and is propped by great poles. Its fruits, which have the appearance of a flower, are used in making beer; and render it more wholesome, while they prevent it from growing sour. The bitterness it occasions goes off in time, and the beer acquires greater strength from it.

THE ALMOND TREE.

You will prefer this tree to all others; for it furnishes the principal materials for sweet-meats, and a number of other good things. Besides, in the spring time it is the first which rejoices us by the ornament of its flowers. There are two kinds of almonds. The bitter are traitors, which often deceive us, when we believe we are eating a sweet one. The wood of the almond tree is used in several pretty small works; such as fans, &c. By the bye, what would you think of eating a few sweet-meats which I have in my pocket? But hold—the parcel which contains them has opened, and
I am

I am afraid they have intermixed with several other things which I had in my pocket.

P. Oh! That is of no consequence. But what are all these little grains?

M. Those which are yellowish, are grains of incense; those which are reddish are grains of myrrh; these smaller and more transparent grains are mastic; and the blackest are aloes; then there is gum. All these are juices, which trickle from different trees, that grow in warm countries. The incense or frankincense, as you know, is a useful perfume; as also the myrrh. They are also used in medicine, particularly the last. The mastic is a species of resin, of great value, which the Turks use much in chewing: it gives the breath a balmy odour, and makes the mouth wholesome. It is obtained from a tree called the lentisc, which is likewise cultivated in Provence and Languedoc, and whose leaves are odorous like those of the myrtle.

As to the aloes, it is intensely bitter, and is obtained from a very singular tree, which grows with difficulty in our climates. What you see is the expressed juice of the plant, dried; it is much used in medicine.

Gum is a viscous juice, yellowish or whitish, and transparent; it exudes from the rind of many trees. We see it on our cherry trees, on our apricot trees, and many others. It has neither taste nor smell, except that which contains a little resin; for there are many kinds. It is obtained from a great number of things.

THE WALNUT TREE.

WITHOUT going farther, here also is a tree whose leaves have a fine smell, beside that the fruit, whither fresh or dried, is excellent, as you know. A very good oil, inferiour only to olive oil, is extracted from it. The greenish husk which incloses the shell is much used by dyers. The wood is the best, and most beautiful, which our joiners can employ. This tree was originally brought from Persia; but it is extremely common throughout all Europe.

You see every where pear trees, apple trees, cornil trees, sweet and sour cherry trees, peach, apricot, quince, and medlar trees. The apple tree is the most remarkable; a very wholesome and agreeable kind of wine is extracted from its fruit, which is called cyder. Perry also is made of pears; but it is not so valuable as cyder. Excellent confects are made of quinces.

Almost all these trees were originally produced in foreign countries, warmer than our own. For instance, the peach has been transplanted from Persia into Europe. The apricot has been brought to us from Greece; the cherry from Asia Minor.

P. But why do not all these ripen at once? — That would be much prettier and more convenient, would it not?

M. Say you so? But who then is it who makes all these grow and ripen for us?

P. It is the good God.

M. Thus you think, that if we had been in
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the place of the Creator, when he was ordering all these things, we could have made a better arrangement ; do you not ?

P. No, I do not say that, I only wish to find at once cherries, apples, grapes, nuts, and all the rest.

M. That is to say, you are not contented, that the Creator gives you one thing to-day, another to-morrow, and another on the day after ; so that each day is marked by new benefits on his part. And how could you eat every thing at once, or preserve every thing ? You see that in winter, after we have received all the productions of the year, we can only preserve some remains of them in a dry state, and very few of them fresh. Do you not love to amuse yourself every day, and especially when every day you find a new amusement. Well, you see the All-powerful has had the goodness to prepare for you almost every day, a new amusement ; a new, useful, and agreeable employment ; every day a new sight gladdens your eyes — every day, a new fruit regales your taste ; every day a new crop enriches your store-house ; and is this the reason why you complain ? You are to blame for it. But be not sorrowful ; rather let us rejoice in gratitude and love for so good a Father. I will explain to you how all this happens, as well as I can.

You see that during all the winter, we are in a manner deprived of all kinds of natural recreations. The mournful and bare earth presents nothing to us but pitiless frosts, which compel us to flee and shut ourselves up in houses, where we breathe an unwholesome air, where our blood is ever dried up by the action of the fire ; where, in short, we sigh in expectation for the return of spring. The spring time then arrives, and rejoices

joices at once all our senses in the sweetest manner. It presents us with flowers, verdant grass, new herbs, and even some fruits fit for refreshing the blood. The summer, which ripens the greatest part of fruits, and of crops, fatigues and exhausts us by its heat; but at the same time, it furnishes us with a number of refreshments. The strawberry, the rasp, the cherry, the gooseberry, &c. In short, every thing ripens, and the autumn delivers to us the more solid food, which we require during winter. We consume during all that time, what we cannot preserve, and which appears to have been given to us, only for the necessity of the moment. We lock up and preserve all the rest for our provision. Could we desire any thing more paternal on the part of our common father? Could that reason which he has given us discover a better arrangement of things?

THE PLUMB TREE.

THIS tree is extremely common, and there are a great variety of kinds of it. Some of its fruits are brownish, some greenish, others yellow, others whitish. Some of them are small, others large, some round, others long and oval. The most part of them have an excellent taste when they are fresh; and they are also dried, and made into what are called prunes. A strong water is extracted from plumbs.

P. I have been seeking every where for olives in the orchard, such as we ate yesterday, but I have been unable to find them. And in
the

the fields I was looking for rice also, but you have not shewn us it.

M. That was not my fault, as you will see.

THE OLIVE TREE.

THIS is a tree which grows only in warm countries, as in Languedoc and Provence; and especially in Italy, in the Levant and elsewhere. The island of Cyprus in the Mediterranean sea, is looked upon as its native country. The olive has a small resemblance of the willow. It is not a showy tree, and rarely grows up well; but it remains green all the year, and requires very little care. The olive, which resembles a hazle nut, is green at first, and becomes black as it ripens. It is pulpy, and its juice is oily. It incloses a very hard stone, which is good for nothing. The best oil or fine oil ought to be clear and limpid, with a greenish colour, and a taste, and even smell of the fruit. That which is yellowish is already rancid or made of rotten olives. That which is extracted from the fruit before it is sufficiently ripe, has no other fault than considerable bitterness. For the olive is so acrid, that it cannot be suffered in the mouth without having been confected in a lye of ashes and quick lime, and after undergoing several other preparations. This oil is the best which can be used in food, and is even eaten by itself with pleasure when it is congealed. It serves a number of purposes.

RICE.

RICE.

RICE grows in a singular manner, that is to say, in the water; and nevertheless, it requires a very great degree of heat to ripen it; although its grain has much the resemblance of corn, it is not so with the ear, which consists in a kind of pannicle, where every grain is found apart in its case of a yellowish colour. The ground where it is sown must be inundated; otherwise it will give no crop. Its stem is knotted, and has some resemblance to that of the Turkish corn. It is thought that this kind of grain was originally brought from Ethiopia into the East, where it has become a daily food, although it is not made into bread, as it might easily be. The Chinese and the Turks, cultivate and consume a prodigious quantity of it. Since the Europeans have cultivated America, rice has been sown there to a great extent with extraordinary success. It is also cultivated in Spain and in Italy; and that which we have in this country comes principally from Sicily and from America. Punch, that drink so much esteemed in Britain, is made with water and sugar, lemon juice and rack; now this rack is made of rice, with sugar cacaonuts, &c. It is a very strong liquor, which the Turks inebriate themselves with; because they are forbidden to drink wine, which is not nearly so intoxicating.

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THE COCOA-NUT TREE.

Cocoa-nuts are as large as the head of a man; although some of them are much smaller. Their shell is thick and hard, and large enough to serve as a retreat to a small monkey of America, called Sagouin, with its long tail. This nut when it is not yet ripe, is filled with a very agreeable juice, which is drunk or put to other uses; but when it is ripe, this juice thickens, and becomes a kind of large almond, from whence may be extracted a good oil or milk of almonds, which is good for eating, having really the taste of an almond. All kinds of vessels, and other similar utensils are made of the shell. It is also covered with a kind of hair, which may be spun, and of which ropes or cloth may be made. The tree is a very singular species of the palm. It has no branches, although the trunk is very lofty, and sometimes smaller in the middle than at the two ends. The head is adorned with small boughs and very large leaves, in the centre of which, the cocoa-nuts grow. This tree alone has the privilege of flourishing every month. A wine, under the name of palm-wine, is extracted from it. Its leaves serve to make sails and to cover huts. Its small branches clothed with leaves, are used as umbrellas. The wood is fit for ship-building, and a number of other things. In short, this tree can supply almost all the wants of life; and its fruit is really almost the only food of a number of Indians.

P.

P. Is it true, Sir, that the corks of bottles grow upon trees?

M. It is almost so, that is to say, they are made of the bark of a tree which is called the cork tree.

THE CORK TREE.

THE cork tree is a kind of oak, since its leaf, its figure, and its fruit nearly resemble those of the green oak, bating some little differences, in size and colour. For example, when its old bark splits, the new bark which pushes it off is seen within, of a brilliant red colour. This old bark is thrown off every seven or eight years, and that for a century or two. It is very thick, but at the same time extremely light, and can sustain heavy bodies in water. I must teach you the use of something which is very agreeable and very convenient, and which may be made of cork; I mean a jacket, with which you may walk in the water without swimming, even with a book in your hand if you choose, although the river be exceedingly deep. With this jacket, there is no danger of being drowned.

JESUIT's BARK.

IN talking of bark, we must not forget a tree, the bark of which is still more precious; since it restores health to diseased people, and cures the fever. It is the quinquina, or jesuits bark, and comes from a tree apparently called Kina, which only grows in Peru in America. It is
not

not very high, and has many branches. That which is most esteemed, ought to be in small pipes of rolled bark, whitish on the outside, and yellowish within. It is an excellent remedy, but precautions must be taken before using it. There is a root called the China-root, which is also a good remedy in certain cases; such as diseases of the skin, when it has been reduced to powder; but this is not a bark, and comes from India, not from America. From its name, it is supposed to have been originally brought from China.

P. The species of trees are wonderfully numerous.

M. What, do you wish to know how many species of trees or other plants there are? There are more than fifteen thousand, and each of the fifteen thousand species may be multiplied by millions of millions. And how many of those do you think we are already acquainted with?

P. Perhaps a hundred.

M. That may be, but we shall get acquainted with many others; and perhaps, in time, we may arrive at the knowledge of almost the whole of them. But this is very difficult; because many of them grow only in very remote countries; as, for instance the dye-woods, and woods of colour. The ebony is a tree, the wood of which is quite black. There is also green, yellow and red ebony. There is the red wood, which is a very large species of the turpentine tree, and grows in America. Others of them are of a violet colour. Some of the woods are yellowish and brownish, streaked with black, and have a sweet smell. There is also what is called the rose-wood, which has the

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smell

smell of that flower. In short, there are woods of every colour, even for dying, such as the woods of campechy, which dye black and violet, besides having a good smell; and the woods of Brazil, which dye red, and many others, which we will know better when we see them.

But I must make you acquainted with some kinds of trees, which have no branches, but only very large leaves at the top.

THE DATE TREE.

THE date tree is very common in all the oriental countries; where its fruit serves as daily food to a number of people. Its fruit is called the date. It is as thick as a plumb; for of a stone sufficiently large, from which an oil is extracted, which the Indians use instead of butter; and of a pulp round the stone, which is very good to eat. A kind of meal, is also made from the stone; and the bread of it, is given to camels; or even eaten by the common people. The trunk is very rough, but the knots are symmetrically arranged. The leaves, with their stalks, are cut down, and are used by the Indians in making a number of things; such as ropes, paniers, sacks, &c. The head of the trunk is crowned with about forty stems, bearing leaves, nearly three fathoms long. These stems and leaves always endure, and do not perish like the leaves of our trees; which qualifies them for the different purposes they are put to. It is apparently on account of this peculiarity, that it was anciently the custom to put the branches of palm or date trees in the hand of those
whom

whom men wished to honour, to point out, that their name and their glory would no more perish than the palm; that is to say, would last for ever. When the tree is young, almost all its parts are good for eating. We may easily see dates, for they are brought here into our country; but they are in a dry state, and have no longer the delicious taste of those which are fresh.

P. You do not mean that sort of black almonds without a shell, which my mother gets pounded, and mixes with sugar?

M. O no, these almonds are not so large nor so long as dates. You mean cacao for making chocolate, do you not?

THE CACAO.

THIS is a pretty large tree, always bears flowers and leaves. Its fruits are as large as a cucumber, and have almost the same shape; but the shell is divided like the rind of a melon. They are suspended along the trunk on the large branches, instead of being at the end of the small ones, like our fruits, which is common in the case of several other American trees. These shells are filled with pretty large almonds or seeds, to the number of thirty or forty, enveloped in a kind of white pith, good to eat or to suck. These almonds are toasted, and afterwards pounded and converted into a paste, which is called chocolate, in which we infuse sugar, if we wish to sweeten its bitterness, or aromatics, &c. to give it a good flavour, and more or less strength. The commonest kind of these aromatics is the vanilla; but the chocolate, in

which sugar alone is mixed, is the most wholesome; because the other infusions are too heating, and hurt the health. On this account, it is made up in general, without any mixture at all; and when used, every one adds to it what he pleases. The Spaniards first brought it to Europe; and since 1520, they, and the Portuguese, were the only people who used it, till 1646, when it became known to other nations. In 1680 it began to be a subject of commerce. It is a very wholesome and nourishing food.

THE VANILLA.

WITH regard to the vanilla, which is used to season chocolate, it is a creeping plant, like the pea or the French bean; but its stalk is thicker, like that of the pumpkin. It bears pods as thick as the finger, and about half a foot long, filled with a number of small black seeds, which exhale a very agreeable smell, and have a very strong taste.

But I have not yet mentioned to you the most surprising of all vegetables. What would you say, if you should see a plant, which should contract and withdraw its leaves on your attempting to touch them?

THE SENSITIVE PLANT.

THIS singular plant has received this name, because it appears to be endowed with sensation.

P. But has it none in reality?

M.

M. Hold—I will tell you. This plant is not large; its stems always creep towards the earth; its leaves are long and narrow, and very smooth; its flowers are produced at the bottom of the leaves, and are of a beautiful carnation colour. It generally grows in warm moist places. The singularity of this plant is, that, when touched, its leaves draw back, and approach each other, fade away, and do not recover their vigour for a considerable time. It is still more remarkable, that, when the sun sets, the plant seems to die or fall asleep; and afterwards awakens on the return of day, and appears beautiful in proportion to the brilliancy of the sun. The same thing happens, when a storm or a thick mist suddenly comes on; it loses its vivacity, and perfect darkness has a greater effect on this plant than the rudest touch; which demonstrates, that it does not possess what is called animal sensation.

A kind of it grows in India which would make you laugh; for a fly no sooner comes to sit down on the middle of a leaf, than the leaf closes upon it, in such a manner that the fly is taken; on this account it is called the fly-trap. In the same manner it will seize the end of your finger.

There is also in America, a shrub which lowers its branches when you pass near it; and as it has thorns, such as are too close to it, may run the danger of being pricked.

Ah! do you see in that little brook that green parcel of filaments intermixed together? Let us draw them out of the water. This is called *conferva*. There is another species called *tremella*, because it seems to tremble. Each little thread is a separate plant; and, what is more extraordinary, when these are cut in pieces, each piece also becomes a plant and exists by itself. Thus

the nature of this plant approaches nearly to that of the species of worm called polypus, which does not die when cut in pieces; but each piece lives and becomes an entire insect like the first.

P. Where do we meet with these then? How, I wish to see them!

M. We shall fall in with some of them by and by. They are not very rare.

THE

ANIMAL KINGDOM.*

MASTER. Now then, one of our books is finished. What title shall we give it?

PUPILS. *The Vegetable Kingdom or Plants.* We must next complete that which is to contain the Animal Kingdom; must not we?

M. With all my heart. Then we shall see both our great and little companions, which can run and eat like ourselves.

P. Some of them can swim too, and others also can fly; can they not?

M. And there are others still which crawl.

P. But that is still to move; is it not?

M. So that if we find any thing which has not the power to move, we must not class it with the animals.

P. Vegetables do not move, do they?

M. Can one move without walking?

P. For instance, when we are sitting, and either eating or playing; is not this to move?

M. Surely; we shall find certain animals which do not quit their place, and yet move, for they eat.

P.

* The Animal Kingdom has been treated of at the greatest length, because it interests children more than the other two; while it is at the same time to be understood that the preceptor will take other opportunities of acquainting his pupils, with a much greater number of plants than have been put down here.

P. Are there nearly as many species of animals as of plants?

M. Which do you think most admirable, a thing which only vegetates without the power of loco-motion, and without feeling, as a vegetable? or a thing which lives, which feels, which acts, which moves, which walks, &c. as an animal?

P. That which has the power of loco-motion is the most beautiful: Is it not?

M. Well! if the Creator had however peopled the earth with a much greater number of living and animated beings, than of beings which merely vegetate; what would you think of such magnificence?

P. Is such a thing possible?

M. Hitherto many more animals than vegetables have been discovered; about twenty-five thousand species are already known, and new ones are found out every day. Nevertheless, it cannot be said, that there are more animals than vegetables; though animals prey on one another, yet the greater number live on vegetables, so that, in that case, the animals would want nourishment. Therefore we find that each species of vegetables is more numerous than each species of animals; for instance, there are more ears of corn, than there are animals which feed on it.

P. And where are they all then?

M. Some on the earth, others in the earth; others in the waters, at the bottom, in the middle, upon the surface; others are alternately in the water and on the earth; vast numbers live on plants, and on other animals; and there are many so small, that they cannot be seen without a microscope.

P.

P. But how do we discover that these little—
little things are also animals?

M. In the same way as we discover the larger to be animals; that is, because they have motion and life. But I'll lay there are larger animals which you see every day, and which you do not know.

P. How can that be?

M. How many animals, for instance, do you think there are in this chamber?—Come, count well.

P. There, in the first place, is a canary in this cage; a goldfinch in the other; yonder is a parrot on his ladder; these are three already. And then there is *Sultan* under the table; let us see—ay, there he is, four. Then I do not know how many flies there are; I cannot follow them to reckon them.

M. Well! do not mind the flies, nor such, as perhaps we do not see, because they are too little; let us speak only of those which are not less than a canary bird, such as this.

P. Well! but in that case I have counted them all; I see no more.

M. You have a bad memory; look well.

P. I see nothing more, I have

M. Would you have me show you, here in this chamber, an animal larger than *Sultan* and you both?

P. Ah! if you have any concealed in some corner; and where is it then?

M. Look at me well.

P. Very well! so I do.

M. Well! do you not see it then?

P. But it cannot be you, master?

M. Who then, when you are looking at me? Is it because I do not eat, is it because I do not walk,

or is it that I do not live, or that I do not feel? What hinders me that I may not have the honour to be an animal, as well as you yourself?

P. But am I one too?

M. And why not?

P. But we speak, and animals do not speak.

M. Ah, yes? not amiss; hear the parrot---
you lie, you lie Well then!

P. Yes, but it does not know what it says.

M. Very well! what of that? There are some animals which speak with intelligence; others which speak without knowing what they say; and others which do not speak at all.

P. But yet animals are not made like us.

M. Is a fish made like a bird, or like an ox?

P. But all these are beasts, and we are not beasts.

M. You are in the right, we are not beasts; but why will you not allow us to be animals?

P. Are they different?

M. All beasts are animals, but all animals are not beasts. Every thing that lives, feels, and moves, is an animal; and we possess these faculties. But every thing which lives; and, at the same time, thinks and reasons, is not a beast; so that we are animals, without being beasts, or to use another word, brutes.

For there are two general species of animals, reasonable animals, and brutes. For this reason, when any of us happens to do, or say any thing which is unreasonable, he is called a beast, or at least, it is called doing or saying a foolish thing.

P. But how is one to know if a person do or say a foolish thing, or not?

M. When we can understand that, we shall be men of sense. In the mean time, let us
hear

hear every thing with attention, let us examine every thing, so that we may be well acquainted with whatever any person may have occasion to speak of; and above all, let us take the utmost care not to speak, till we have considered two or three times, what we are going to say. Then, if we should still chance to say a foolish thing, at least we should not do it so often, nor should we resemble this parrot which is constantly prating, and stuns us with its clatter, without knowing what it says.

P. Or, like the fine gentleman who came the other day to our house, and who made mamma so often shrug up her shoulders, for he talked incessantly?

M. Well! do you know one thing? In classing animals in our book, we shall place them beside those kind of people which they have the nearest resemblance to: for instance, the great prattlers, like your fine gentleman, we will place them beside the parrots.

P. Ah, yes, that will be fine.

M. Well! will you consent to be an animal now?

P. Oh, yes, but not to be a beast.

M. Attend; some beasts show a great deal of intelligence and prudence; as we proceed to pass them in review before us, you shall tell us which you would most wish to be associated with. Besides, you will see that a great many things may be learned from beasts, and that in reality man has imitated them in many things, though he be the sovereign of the universe.

P. How comes that?

M. Yes, most certainly, you are a little sovereign of the universe; but it is only in proportion to your address and intelligence.

The Creator - sending us into this world with the power of digging it up and dislodging every thing upon it, and also with judgment to select among all these things, and to understand the reasons why we arrange them after this or that particular manner, seems to have surrendered up nature to our pleasure ; so that we seem to be the sovereigns of it. We have known well how to use this authority to our advantage. You see how we have tamed and reduced to slavery, several species of animals which we chain down to our service, or slaughter for our sustenance. We go out to the chase of such animals as are not tamed, we pursue them, we expel them, we kill them, we eat them also, when we find their flesh to our taste. There are beasts, it is true, which also devour men ; but men have the sense to unite, and construct arms which are more terrible than the claws or fangs of beasts ; and then no beasts can withstand them, because they want the same intelligence.

The case is the same in respect of the fruits and productions of the earth ; we have possessed ourselves of the best, and have even found out the means of improving and bringing them to perfection. We have contrived to have them raised around our houses ; and for building even these very houses, we have contrived to draw all the necessary materials from the earth ; and we every day load this very earth with the enormous weight of our buildings, which we still farther embellish and render commodious. We have contrived to dig up from the bowels of the earth, materials to arm ourselves with, and render us superior

rior to all brute animals, even the largest and most formidable.

Thus, we cannot live in the water like fishes, and nevertheless we have found means to reach them in the water, and draw them thence for our subsistence. We have contrived to make ourselves, houses in which we travel on the waters into the most distant countries; such are vessels. In vain, do birds possess wings to escape and fly us, challenging us to airy regions where we cannot follow them. We have learned to wait for them till they are compelled by fatigue to return to the earth; or else we know how to make them descend against their will, by wounding them in their airy regions, and astonishing them with our thunder. Farther, we have contrived boats which rise in the air, where we can chase the winds as we do at sea. In a word, from one extremity of the earth to the other, we have sought out, discovered, and made ourselves masters of whatever could administer to our wants or our pleasures. Is not this to be *king*? But this empire is not that of a sluggard, who reclined on a sofa, thinks it sufficient to will and to command; it is the empire of vigour, of address, of wisdom, of industry, of persevering indefatigable labour. All this is necessary, not to be a beast.

P. But beasts are not all made after the same manner.

M. You see that, yourself: however, in general, you will observe in every beast, a head, a body or trunk, and limbs. The head is joined to the body, by a part which is slenderer than either, called the neck. The trunk is next divided into the superior part called the chest, and the inferior, called the belly. The
par

part situated behind, is called the back. All this is not absolutely general and uniform. But one thing common to all animals without exception, is to have the body covered with skin, which forms a part of it, and which in some is soft and tender; in others, hard and coarse, sometimes covered with hair, sometimes cloathed with feathers, sometimes with shells, &c. A great number change their skin every year, as insects and reptiles; the caterpillar changes even two or three times in a year. Others change but the covering of their skin, as geese and other birds which moult; that is, which shed their feathers; as also hares, wolves, bears, which cast their hair every year, and which put on a new fur before winter. It may even be said that all animals, and we ourselves change every year. For it is obvious that we every day in part renew our body by the fresh nourishment which we take in to supply the loss which it daily sustains; so that at the end of a certain period, perhaps a year, it must necessarily be wholly changed, and we no longer possess the same body which we had in the preceding year. How do you relish this? You did not know that little Emily here, is not the Emily of the former year.

P. And what then is become of last year's body?

M. Is it not true that if a man should abstain from meat for a long while he would become shockingly lean; that is, his body would be no longer so plump as it was formerly. Thus you see then clearly that our body wastes without the use of food; and that our eating is but to repair speedily and daily our loss, for fear of our becoming thin. These are so

many

many daily changes which our body undergoes; and after a certain period, our whole body changes, so that it is no longer the same.

P. But it is always we; is it not, master?

M. If any one has given you last year, a slap on the face, which you then had, but now possess no longer, is it not true that you should no longer harbor resentment against him? For the affront does not concern you of the present day.

P. But nevertheless I constantly recollect it.

M. And if any one has done you a favour, you recollect it perhaps still better, don't you?

P. Oh! Yes, certainly.

M. I know it; but how does it happen then, since you have no longer the same body you had, but are wholly changed?

P. But is that too altogether certain, that it is wholly changed?

M. We cannot affirm that the whole is completely changed, even to the bones, or the hard and solid parts of our body; but does the memory reside in the bones, that they should recollect the good or ill that has been done us?

P. Our head contains the memory; does it not?

M. There are bones, blood, flesh and other things nearly of the same kind in your head. Is it the blood which has memory, or is it the flesh, or are they the bones? Which of the three, in your opinion, has memory?

P. But blood cannot have memory; can it master?

M. Very well; is it the flesh then?

P. But must it be the one or the other, master?

M.

M. There would be some difficulty in making you believe it; would not there? Certainly, neither the bones, nor flesh, nor juices can recollect.

P. But how then?

M. Do you recollect; it is not your body which recollects, nor your head, nor your feet, nor your chest; then it is something else which has memory; so far then, there is no doubt.

P. But what is it then?

M. It is that which returns to the Creator when we die, and our body is interred in the earth, where it remains and becomes earth again.

This it is, which feels, which recollects, which thinks, which reasons, which does good or evil, which is truly ourselves, and which causes us to continue ourselves, whilst our body changes, becomes earth, or air, or vapour, and all these materials restored again to vegetation, serve to supply fresh growth to vegetables, similar to those which have nourished us, and which will nourish others*.

S. And what is it called?

M. We call it our soul.

S. Ah! I know now; mamma's chambermaid says that when one is good, very good, the soul flies away to heaven like a pigeon; is that true?

M. You have just seen that the soul is formed for thinking and feeling, and not for flying,
nor

* We were of opinion, that it would be improper to explain the constitution and nature of man, without saying a few words to children of that which distinguishes them from beasts. Endeavouring to suit ourselves to the capacity of that tender age, we have given here only the outline, which it is the business of the intelligent preceptor, worthy of so honourable an employment, to fill up.

nor swimming. Without doubt, the Creator rewards his reasonable creatures when they are obedient to his laws ; but there is no occasion to make souls swim or fly, to render them completely happy.

S. But have dogs also a soul, because they feel when we strike them * ?

M. You see that beasts can do neither good nor evil, because they are not possessed of reason like us. Hence it is, that though we be animals, we are not however beasts. We resemble them only in the nature of our body, which is formed of flesh and bones, like those of beasts, and which also perishes at last in the same manner. But let us prosecute the examination of the animal body in general. Under the skin or hide are found fat, flesh, bones, muscles, tendons and cartilages, and a prodigious number of vessels or small tubes, some of which are filled with blood, others with colourless liquors.

All animals have not red blood like men, oxen, and others. Some animals have warm blood which is always red ; such as birds and viviparous animals, that is, animals which bring forth their young alive, whether inhabitants of the land or water. Some fishes have also red blood, but as it is not so warm as ours, we call it cold. Lastly, insects and small reptiles or worms have their blood cold and white.

What

* We need not be surprised to hear children put this question. We see from the conversation which follows, that it might naturally occur to them : As to the answer which is given, I believe no other could be given, without running the risk of speaking to them without being understood. Learned discussions on this subject do not suit their capacity.

What are called the entrails, are the internal parts of the body, as the heart, lungs, spleen, stomach, liver, bowels, &c. All these are appropriated to some function necessary for the preservation of life.

Animals differ from one another in their manner of breathing, and in the number of their senses.

Some breathe through the nose and mouth; others have holes and canals constructed after a different fashion. What are called, improperly indeed, the gills of a carp, are not the ears, but the lungs of the animal; through which it takes in water, and at the same time, air contained in it, for which it has occasion.

A great number of animals have some kind of voice; many others are destitute of this faculty. It is the same with the sight, hearing, and smell; some animals want these senses. But all have some kind of feeling and taste, without which they could not live. As to speech, that belongs to man alone; there is no other animal which possesses this faculty.

P. But our parrot speaks too.

M. Birds have their organs of voice delicate and pliable, beyond those of all other animals. Some of them warble delightfully; and we have succeeded in teaching others to imitate some portion of our tunes, and of our enunciations. But speech is not natural to them. They only repeat a tune, or a few words, which they have been taught a thousand times. They can neither alter, nor add; they say the same thing continually, without the smallest meaning. Besides, no parrot, starling, or magpie, has ever been able to teach one of its own species, those words which it repeats itself. These
animals

animals, therefore do not speak; they only prate or chatter.

Some animals bring forth young ones like themselves, for instance, cows and sheep. These we observed, are called viviparous, on that account. Others lay eggs, from which, after a certain period, young ones are produced; for instance, pigeons, common fowls. These young ones again rise gradually to their full growth, and then, in their turn, hatch others. Such as lay eggs, are called oviparous.

P. But what do all these animals live on?

M. Some live on vegetables; they eat seeds, grain, herbs, and the fruits of trees too. It is curious, to observe a squirrel eating nuts; they are his favourite food: and he takes care to lay up a store of them in harvest, in the hollow of some tree for his winter provision. Other animals subsist on such as are weaker than themselves. The wolf, for instance, preys on lambs; the fox on fowls; the lion devours even wolves, and other animals still larger. The large fishes prey upon the smaller; birds of prey devour other birds; the kite, for example, devours pigeons; small birds live on insects and other little animals. But man eats every thing, birds, fishes, quadrupeds, herbs, fruits, grain, &c.

P. But do the small animals allow themselves to be taken at pleasure by such as are larger?

M. You see how the hare often foils sportsmen and dogs. Every one makes the best defence that it possibly can; but still a great many are taken. Each animal knows well his enemy, and tries every art to escape him. But all this proves of no avail. The Creator has constituted things after such a manner, that the smaller animals should serve for subsistence to the larger,
the

the weaker, to those which are stronger, and that one set should make room for another.

P. But what then lives on the larger animals?

M. Man pursues and kills as many of them as he can, whether for the purpose of food, or solely to preserve those animals, which they would otherwise destroy. Besides, the large ravenous beasts are not so numerous as the more gentle animals. There are a prodigious number of sheep, hares, oxen, even fowls, &c. . . Whilst there are but few wolves, tigers, eagles, &c. What too is another effect of the care of divine providence, is, that ravenous animals produce not near so many young as others.

Nor are these ravenous animals without their uses to us; they rid us of carrion, or the carcasses of dead animals that might offend our senses. Wolves, cats, dogs, take this office; ravens assist too, as you may often have observed. So that you see Providence has wisely arranged and provided for every thing.

P. But if beasts were not killed, would they live long?

M. There is a great difference in the duration of the life of different animals. From one or two days, months, or years, even to a century and more, we find animals whose lives are of all the intermediate durations. And there are even some animals of the genus of flies, which live only a night, and never see the sun: some others live only an hour or two.

P. And those animals which live so long, so very long, how do you call them?

M. A hundred years and more? These are the whales chiefly, of the class of fishes; but there are also birds which arrive at this age. An eagle

agle, for instance, has been known to live a hundred and five years, at Vienna in Austria.

But all that, in my opinion ; is nothing to the wonder, which we are just going to see.

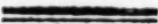
P. And what is that, master.

M. We are going to make small animals with our knives, and our scissars; for I have promised you a search for polypuses, and we shall go whenever you please.

P. Come, come, I am quite ready ! but are we then going to see a miracle?

M. Not one, but a hundred. We shall divide a polypus into two, three, four; every piece will produce feet, a head and a tail, and we have only to divide it again to obtain others. A worm which crawls and even moves with the greatest difficulty, shuts itself up into a shell, and comes forth from it, to fly from flower to flower, and from tree to tree. You shall see! you shall see!

P. Come, come!



WORMS.

These animals have their blood warm and white, are without bones and feet, and even want antennæ which insects possess. Many of them, are however provided with filaments which they wrap round them; they live on grass, mud, small insects. Some lay eggs, others bring forth young, and all die without changing their condition or shape. It is true, that earth-worms, and lumbrici, are furnished with hair in the form of a brush, or a kind of projections like crotchets; but these
are

are not feet, such as flies, maybugs, gnats, &c. possess.

This class of animals, together with that of insects, is the most numerous of all. Nature seems to have wished to multiply animals in proportion to their smallness. The very names even of those species which are known, form a long catalogue, not to mention such as have hitherto escaped our observation. We shall now observe a few of them.

EARTH-WORMS.

THEIR bodies seem composed of rings which approach and recede from one another alternately. When it has happened to rain in the night, or even during the day, so that the soil becomes wet, then we observe them to come out of the earth, either all together, or in part, and the soil seems bored, as it were, with small holes. Thus, though we be little acquainted with their use, we may observe that they serve to loosen the soil, and give an easier entrance to the showers of rain. Such as fish with the line, make use of them for baiting their hooks. Besides, poultry, and many other birds, as well other little animals, use them for food. But, on the other hand, they do much mischief in our gardens, gnawing the roots of plants. They lay eggs and propagate with surprising celerity. They are very tenacious of life, since they do not die though cut into two or three pieces; so far from that, every piece becomes a new worm, complete in a little, in every part. But if kept

kept in the sun they soon die. The mole is their most formidable enemy.

INTESTINAL-WORMS.

THESE are the best known of such as lodge within the human body; but there are many other species, almost as many as there are distinct receptacles for them in the human body. Such as are found in the bowels or intestines, are about the length of a hand breadth, without hairs like the earth-worms. They are viviparous, and are sometimes found in prodigious numbers in our bodies.

THREAD-WORMS.

THEY receive this name from their shape; for they are exceedingly fine, not coarser than a thread, of the length of half a foot, and even much more, for some of them are even four or six feet long. They are found in water, in moist clay soils, sometimes in the human body, and in the bodies of other animals. There are five species, but the most remarkable are these :

1. The cutaneous worm, or worm of the skin, named also Guinea-worm, because it is remarkably frequent in that part of Africa, though found also in the Levant, in Arabia, in Persia, &c. These worms insinuate themselves under the skin, near the ankle-joint, the knee, or in the arm; there they grow by degrees to the
length

length of seven or eight feet, and occasion painful tumors, and other symptoms. They are also called nerve, or sinew-worms, in some countries.

2. The water thread-worm, is but half a foot long, and lives in the water, or in mud, and even in certain parts of the bodies of horses, and of some birds. These are also named calves-worms, because animals sometimes swallow them in drinking, which does them much harm.

THE LEAPING WORM.

THIS worm is about the size of a maggot, of a yellowish colour, with a white spot, on that part where the intestines, as seen through its transparent skin, are situated. It inhabits marshes, putrified roots, the large guts of men, and horses.

THE TAPE-WORM.

IT resembles a tape formed of different pieces joined, each of which has its own mouth and intestines; so that each of these pieces may separate, and live in the body where it is lodged. It attacks men, horses, dogs, cats, monkeys, &c. It is well known under the name of *tænia*, and the solitary worm. Tape-worms have come out of the human body, above a hundred ells in length. It is a cruel guest to such as have the misfortune to furnish it a retreat in their bowels. There are three kinds of these worms;

worms; one with short pieces, another with long, and the last has large articulations. The last are the most common, but the first are the most dangerous, because they grow very rapidly, sometimes even to two hundred ells.

THE LIVER-WORM.

It is named thus, because it is frequently found in the livers of sheep and fishes, where it often continues to live, even after the animals have been killed, and the liver dressed. It is flat and white, and has also been called the gourd-worm.

THE LEECH.

THIS, too, is a species of worm, with a naked body, of a blackish colour, an oblong shape, but not pointed at either of the extremities. It lives in water and in marshy ground, where it fixes itself to the skin of animals, and sucks their blood, as it likewise does to men. Hence the use that is frequently made of it for extracting a quantity of blood.

Into this class of worms are put all the snails, slugs, small shell-fishes; as oysters, muscles, &c. polypuses, star-fishes, insects which inhabit, corals, sponges, coralines, medusa-heads, marine palms, &c. Out of all these species, together with those which follow below, are formed five classes.

VOL. I.

F

The

The first, of such as have a naked body, and want limbs.

The second, of those which have limbs, but are naked.

The third, of such as are covered with shells, as snails, muscles, called testaceous.

The fourth, of the zoophytes, or animal-plants, as the polypuses.

The fifth, of the lithophytes, or stone-plants, as corals, &c.

The first class has obtained the name of intestinal, either because the worms found in the intestines of animals are all of this class, or because these worms being formed of a soft substance, without bones, and wanting legs, resemble small intestines. The second has been named mollusca, from its substance which is destitute of any hard or solid part. The third, or the testaceous, which signifies having a shell, is the most unmerous, as well as curious class. To speak properly, these are of the mollusca, lodged within a shell, more or less hard and solid, of a calcareous nature, (that is of the nature of limestone.) Among this last number, may be reckoned a very singular fish, which throws out a black ink, and of which there are two species, the calmar and the cuttle-fish.

P. But what purpose does this ink serve?

M. It serves no purpose to us, but is very useful to it. It has no protection in its own soft substance; it is therefore under the necessity of concealing itself in a cloud of ink, by which means it escapes from its enemies. The largest of the testaceous, is one of the species of *chama*, which weighs often six hundred pounds, and can cut the largest cable.

There

There is a species of small scallop, which, in fine weather comes to open its shells on the surface of the sea, keeping the one flat, while the other is raised like the lid of an open snuff-box ; so that the wind makes it swim, giving it the appearance of a sail.

The smallest of the testaceous, is the little tooth-fish, which can scarcely be distinguished from the grains of sand, with which it is mixed. These form the whole race, or all the families of worms, strictly so called. For we often give this name to insects, which have no connection with them ; for instance, such as are found in cheese, fruits, &c.

P. But what are these then, if they be not worms ?

M. They are larvæ, that is, masks ; for these insects do not die in the same condition in which they were born. They undergo one or more changes, and conclude their existence, after becoming winged animals. A fly forms a nest for depositing her eggs, on a bit of meat, cheese, &c. In the course of some days, a creeping animal comes forth, called a larva or caterpillar, which again, in its turn, becomes a fly, by a kind of second birth.

P. And how does this take place ?

M. By passing through the state of chrysalis, or nymph, during which, the larva is covered with a pellicle or shell, more or less hard, does not eat, and at last assumes the form of a winged insect, a fly, butterfly, &c.

On the other hand, worms, snails, polypuses, continue always the same they were at first, and experience no other change, but what consists in an addition to their growth.

P. That is surprising !

F 2

M.

M. It is. When we think the animal dead, because it is without motion, and takes no food, it revives under a more splendid and airy form. Did I not inform you that you would see wonders?

P. But do snails, which shut themselves close up within their shell, suffer the same change?

SNAILS.

M. No: the snail does not change its shape; in spring it breaks open the door, which it had made to its house, and comes forth to feed as formerly, after fasting the whole winter.

Some snails have shells, and others are without them. What you see on their head, are the antennæ, or feelers, which serve as guides to them, by feeling round about them; though the two black points, which we observe on the extremities of the large horns, have been suspected to be their eyes.

P. But have they no eyes then?

M. It seems that they have no occasion for them, because their horns give them a sufficient perception and knowledge of those objects, which they approach. Besides, if the snail happens to find his house damaged, he immediately repairs the breach with his slime, which becoming hard, closes up the hole. Farther, if we cut off any part of his body, it soon sprouts again, though a little disfigured. The head, however, does not sprout again, when once it has been completely cut off. But if the skin surrounding it be taken off, while the snail coils

coils itself up, the head appears again immediately.

P. And have you, Dear Sir, taken off the heads of snails? As for me, I should be sorry to injure them.

M. When one cuts off the head of a snail for instruction, and to learn some new wonder of the All Divine Power, it is not like taking delight in tormenting animals for our amusement. Hence we are allowed, even to kill them for our subsistence.

P. But these poor animals are enough to be pitied already, having their house to carry about with them every where.

M. It is rather an agreeable convenience, though it occasion a little delay, as they can always get under instant cover. Others are forced to seek holes for shelter; and on the approach of winter, to dig a retreat in the earth, whilst these are constantly at their ease.

P. Ah how pretty! see how the shells are chequered in every manner that can be imagined!

M. I shall shew you others much prettier by and by.

Sea snails have shells of every shape. The Creator seems to have taken delight in presenting us with models of every variety of shape, and with assemblages of the most exquisite colours. Some are circles, others demi-circles, some long, some short, some oval, pointed, pyramidal, rolled up in a spiral, in the shape of ears, of horns, sickles, and a thousand other forms. Some have but one shell, or are univalves; others have two, and are called bivalves; others have a still greater number, and are called multivalves.

These three differences, form three classes of shells, the species of which have received names corresponding to their shape, as trumpets, screws, tuns, porcelains, purples, rocks, pipes, boats, sea ears, of the first class; oysters, muscles, hearts, combs, cutlers, and others of the second; acorns, &c. of the third.

Some live at the bottom of the sea, of lakes, of rivers, where they bury themselves in the sand; others attach themselves to rocks, or to the barks of aquatick animals. The tortoise, for instance, often carries muscles on its back.

Sea tulips or acorns are always found on the margin of the sea, or on board of ships, where they continue immoveable; they are frequently observed on the backs of tortoises, muscles, lobstero.

The screws continue also on the brink of the sea, or on rocks. They dig an hole in the hardest stone, in branches of coral, or in thick beds of oysters, and there continue immoveable.

Cockles, which are the largest species of muscles, some of them weighing nearly six hundred pounds, are also named *pinnae marinae*.

MOTHER OF PEARLS.

WE distinguish by this name, those rich shells which furnish pearls; especially those shells which afford the most beautiful pearls, and these in greatest plenty. For there are other shells which afford them likewise, as the black muscles

cles found in fresh water. A pearl-shell has always more than one pearl; frequently as many are found as there are found worms dead within. It is said too that pearls are only formed in consequence of a disease of the animal, the extravasated juice which forms them being naturally designed for lining only the internal side of the shell of this beautiful bed of mother of pearl, whose colours are so brilliant; ---so that when the worm is attacked with this disease, pearles are found even in its head and intestines.

But the part of a shell where pearls are most frequently found, is round the edges; and generally near a hole made in the shell by another sea-worm named scolopendra. To shut up this hole, and to prevent the entrance of the water into the shell, the muscle or oyster throws out a colourless juice which becomes hard, and forms a ball larger than the hole. These balls form the most beautiful pearles; and hence comes the custom of seeking sclopendræ, to put them in greater numbers in those places where pearls are fished, with a view to obtain these more beautiful.

The muscles which furnish pearles are found in many countries; there are some of them in a small river *Voges* which runs through Lorraine. There are some in the *Elster* a river in Saxony, the Muldaw, in Bohemia, and in many places of the north. But the most beautiful, and the greatest number are brought from the seas of Asia, and especially from the perisan gulf, where they are found at the bottom of the water. These are the eastern pearls, which sell so high. A single pearl of a round shape, and good water,

that is, of a fine transparent white, at the same time large and without flaws, costs from one crown, to ten, twenty, and even more. There are four principal pearl fisheries in this part of the world. But they are likewise fished in America on the coasts of Mexico, where there are four fisheries also. The oriental mother of pearl are commonly a foot in length by half in breadth, and a finger breadth in thickness, of a flat round shape, of a greenish grey without, but the most beautiful white within. Pearls have naturally no holes in them; and what we see in them have been made on purpose, to hang them by a thread or otherwise. A string of pearls is a row of these jewels threaded together. The mother or shell which furnishes the pearls, answers for making buttons to clothes, heads to canes, snuff boxes, and several other little small articles.

THE PINNA MARINA.

THIS species of muscle is remarkable, chiefly on account of the extremely fine thread, by which it attaches itself to the rocks, to prevent its being carried off, or tossed by the waves. These threads are as slender as the finest silk, and half a foot long, and more. Stockings, caps and gloves are made of them in Italy, as at Reggio, Palermo, and other places. This fish is also called the *nacre* of Provence, because it is likewise found on the coasts of the Mediterranean.

THE

THE OYSTER.

THIS fish is much sought after, in France, England, Holland, and in the north, where it is caught in great plenty; eaten raw with a little salt, boiled in water, or dressed with butter. The shells, are at most, the size of the hand in breadth, nearly a finger thick, sometimes reddish, sometimes bluish, sometimes grey. The animal which they inclose, is the size of a snail or less.

The oyster, then, is a bivalve sea fish, of a round shape, or nearly so, which remains constantly in the same place, which never comes abroad from its shell; and shows no other signs of life, than by opening and closing the two shutters, of which the shell is formed; or by thrusting out a kind of tongue or paw, with which it grapples, and draws its house like the craw-fishes; but so slowly, that it has scarcely been considered as a movement, and has not been observed at first. In the town of Leyden, an oyster-shell has been preserved, which weighs a hundred and fifty pounds. There are some oysters with a beautiful shell, and which are very high priced, as the royal mantle and the Polish hammer; the first is sold at, from ten to twenty crowns, and the other at one or two hundred crowns; at present, they bring even a better price. The hammer, from its shape, might properly enough get the name of crotchet, or carpenter's rule. See Plate V. fig. 5.

CONICAL-SHELLS, OR HORNS.

To this class belongs the admirals, (Plate V. fig. 4.) which are the most valuable and scarce of all, have been sold at from two to three hundred crowns, and cost, at least, from twenty to thirty crowns a piece. They derive their value in the eyes of *amateurs*, from their beautiful colours of different shades; and they are distinguished into separate species,---among others, the vice admiral.

THE PORCELAINS.

THESE charming small shells are so named from their beauty, which resembles that of porcelaine dishes. They have no need of being cleaned, on coming out of the sea, like other shells, nor stripped of a nasty *envelope*. A great number of them have some resemblance to an egg shell, opened lengthways. Some have only one edge folded in, others have them both. These last, are called Guinea money, because some nations in Africa make use of them for this purpose, as well of bitter almonds. A great many of them are fished near the Maldives.

HELMETS.

THESE shells have their name from the resemblance they bear to the Roman helmet.
They

They have also a slit lengthways. David's harp is a beautiful species of this kind.

THE ARGONAUT.

THIS fish is also called nautilus ; it has a flat shell, scarcely the breadth of two palms, as white as milk, very thin and light, and partly transparent, as if made of paper ; and thence comes its name. The animal which inhabits it, is a species of polypus, with eight feet, resembling a spider. It is not fixed to it ; but nature has furnished it with sails, oars, and helm, by means of which it sails boldly on the waters, dives with its little boat, rises to the surface, and performs all the manœuvres of the most skilful pilot. Of the eight feet or arms, two stretched out high, and connected by a thin membrane, resembling that which joins the toes of geese or ducks, furnish it with sails and masts ; another serves it for a rudder, and the rest for oars.

As long as the sea is calm, and it sees no enemy near, it is constantly out at sea ; but as soon as a storm rises, or it thinks itself in danger, it folds up its sails, masts, rudder, and oars ; inclines the hinder part of its bark to fill it with water, and make it sink. Then to return to the surface, it again turns its bark up side down, inflates it, to make it rise in the water, and by this means comes to the top. It is said, that from it, men have learned the art of navigation ; and in truth, as our barks resemble its shell, it is sufficiently evident that the Creator has not taken them for models, but

has given this skillful mariner, to serve for one to us.

There are several species of the nautilus, among others, one with a shell that is smaller than that of the argonaut, but thicker, and lined in the inside with mother of pearl, so that formerly it sold very high. In India, vessels for drinking, and other utensils are made of it. It can sail, and dive like the argonaut; and the other species are endued with the same talents.

HORNS OF AMMON.

THESE are flattened shells, rolled up in a spiral form, resembling the horns of a ram; whence they have obtained their name: not that the name Ammon signifies ram, but because the Africans thought proper to represent their God, called Ammon, as carrying similar horns. These shells (Plate V. fig. 11.) are not dear, because they are found in great numbers in every country, and particularly in this kingdom; especially in Burgundy, Normandy, and in Guienne; so that in some places, the earth is covered with them. But all these shells are now petrified, that is, changed into stone; and what is remarkable, is, that not a single species of this shell-fish can be found alive in the sea at present.

THE

THE MUREX.

THERE is no shell-fish, the different species of which have names more remarkable, or more numerous than the rock, so called, because it resembles a rock with sharp points. (See fig. 3. Plate V.) We have the roasted pear, the dry pear, the musick, the full singing, the thunder, the dragon, the helmet, the devil's paw, the scorpion, the turtle dove, and many more. But the most remarkable families of the genus of rocks, are the purples, so called, because they furnish a liquor which gives a purple die, the most brilliant, and most indelible, since it becomes only more beautiful, by being washed. Some of this species are found in Poictou; but they are more plentiful in India. As each shell, however, contains only a small quantity of this red colour, that is, what would half fill a walnut shell; a great number of them are needed for dying stuffs. This is the reason, that stuffs of a purple colour were so dear, before kermes and cochineal were discovered, which afford us an equally beautiful red colour. The Indians, however, still use this liquor, for dying pieces of their dress.

PLATE-FISH, SEA-MOON.

THIS shellfish still preserves with us a name altogether Greek, *Lepas*, which signifies a little plate,
on

on account of its shape. It is found in several parts of the coasts in this kingdom, as those of Normandy, where it is called *Berlin*; in Provence, where it has the name of *arapède*; in Poictou, where it is called buck's eye. The fish, which is a species of muscle, is eaten both dressed and raw. It attaches itself strongly to the rock, by the open part of its shell, which looks like a copper pan, turned with the bottom up, or something similar.

SEA-EAR.

(SEE Plate XII. fig. 10.) This fish resembles an ear, or an oval bason, with the bottom up; one side of which is irregularly hollowed out, with holes, partly open, partly shut, placed at equal distances to the very anterior edge of the shell. Frequently four, and even the length of nine of these holes are sometimes found open; which happens in proportion to the size of the shell; the holes that are shut up, have the shape of a nipple. Some shells have even the number of fifty. They are always richly lined within, and furnish even mother of pearl. This shell-fish attaches itself like the *lepas*, and like it, is eaten also.

VOLUTES.

THEY are named thus, from the shape of their shells, which are turned up in rolls, and seem twisted, but under a prodigious variety of figures.

gures. These are the olive, the mitre, the tiara, which, by their charming carved work, represent nearly a triple crown, (see Plate V. fig. 1.) the Hebrew, the Ghost, &c. This shell contains a firstwith in, which is eaten.

SCREWS.

THESE are very pretty shells, adorned with arbor-work, and exceedingly scarce. There are two species of them, of which the most valuable and most remarkable is the staircase. It is of a pyramidal shape, and has six separate screws which rise like the shoot of a graft. This charming shell, (Table V. fig. 1.) which the Chinese ladies use as an ornament, is seldom longer or thicker than a small longish shaped walnut, very thin too and very white. It is found in the island of Amboyna, which belongs to the Dutch. The finest are sold at twenty, thirty, and even the length of sixty crowns; but pretty enough ones are bought now at five or six.

THE SHIP-WORM.

THESE are worms which consume such wood, as is in water,---as vessels, poles, &c. Of these, are different species. The most dangerous has its head covered with two shells, which defend it, and enable it to penetrate wood with facility. Some of these worms have been found in
our

our ports, where they gnawed the vessels; they have likewise been observed at Venice, where they destroy the stakes. In 1732, they threatened Holland with total destruction, by gnawing the stakes of the dikes which prevents this from country being overflowed by the sea. The Dutch had brought back this worm in their vessels, at their return from America.

SEA PORCUPINE.

THIS prickly fish is also called sea apple; but it is one of those whose shell is soft in the water, like the bark of a tree, and becomes hard only when dried in the air.

The sea porcupine is a worm with legs, covered with a thin shell set with long prickles. It is found in the seas of Europe, as well as in those of India; and may be used for food. It has above two hundred feet, and more than two thousand prickles, which are all moveable, and serve as well as the feet, for swimming, diving, walking, for defending itself, and laying hold of any thing it may chuse. Its feet are larger than its prickles, and when taken out of the water, it draws them entirely within the shell; into which it retires like the hedge-hog. It has two holes, one of which, which is the mouth, is situated below, towards the middle of the body, and the other which is the anus, is sometimes below, and sometimes above, near or upon the very edge. Sometimes these two orifices form but one. There are also some sea porcupines without prickles. Some of the first
kind

kind are found entirely petrified, called buttons, others with the prickles only petrified, which are called Jew's stones.

STAR-FISH.

THIS animal-plant or sea-worm is so named, because it seems to consist solely of four or five large long rays, issuing from the same center. It has at least five hundred feet to carry it, and yet it does not move faster than a snail. Some star-fish are not larger than a crown, and others are larger than the hand, of which some may be eaten, and others are poisonous. When dried, they resemble a piece of leather, of a grayish colour, or reddish brown. Some are found petrified called *asterites*: the more rays these have, the more valuable they are. (Table V. fig. 12.)

The one named Medusa-head (fig. 9. of Plate V.) is the most remarkable. It is formed of an infinite number of ramifications, growing out one from another; the last of which are as fine as hairs. Above twenty four thousand of these have been numbered. All these form a kind of thread, which folds up, and serves the animal for seizing its prey*.

Some curious people collect all these species of shells, which are sometimes very high; and form

* It will be observed, that we avoided giving an explanation of the term Argonaut, which occurred above. The case is the same with the term Medusa, found in the present article. These two explanations belong, not to natural history, but to mythology or fable; and it is too much the practice to instruct children early in this, to render it necessary for us to say any thing of it here.

them, or carry off some limb. How often does it not happen, when the diver is drawn up, that that only a single leg or arm remains to him?

P. I would rather chuse, for my part, not to eat muscles, than to have an arm or a leg taken off.

M. Or be taken altogether; for there are some sea animals which make but one morsel of a man, even with arms and baggage, as has been found sometimes in the stomach of the shark, which is the most terrible of all animals.

P. But wherefore do they go down? Is it not, dear sir, very wrong?

M. There are some people so poor and unfortunate, as to be obliged to do whatever the rich would have them, in order to get a little of their money, to subsist themselves, and their families. For these last, they become true heroes, and real martyrs to paternal and conjugal affection. We should at once pity and admire them. Then there are some rich people, who to become still richer, send for these poor wretches, and promise them a little, very little money, if they will go into the sea, at the risk of their lives, to fetch out all these things to them, which they sell afterwards at a high price.

P. But if I was in the situation of these poor creatures, for my part, I would keep all to myself; and I would sell it to become rich too, instead of giving it to the rich rascals.

M. Without doubt, they have a good right to it, both in nature and reason; but they are the weaker. The rich are stronger, because they are always attended with soldiers and sailors, who are poor unfortunate wretches too, that they

they pay for executing their orders, whether they be good or bad.

P. But I thought that shell fishes and sponges were fished only for looking at, and to amuse us, or else to be eaten.

M. Ah ! if that were the case, such as hire fishers to expose their lives, would perhaps have more conscience, than to expose them any longer. But these rich rascals want pearls and shells only to make money of them ; and money makes us overlook every thing that is good, for the more we have of it, the more we would have, cost what it may. See what takes place particularly in the fishing of pearls, which are the most precious of this class, and which causes the true pearls to come so high.

P. And are there some false pearls then ?

M. Yes, indeed, pearls are counterfeited, and false pearls are much more frequent and a better bargain than true ones.

P. And what means do people use to counterfeit them ?

M. They have observed that true pearls are filled with a kind of fat or white oil congealed. Then they have contrived to make small balls of glass, of the size of different pearls, into which they pour a varnish, formed in part of a shining substance from the scales of fishes, to imitate the lustre of pearls, and afterwards filled up with white wax. This is the whole secret. There are others again who try the experiment with pieces of mother of pearl, and which I should like still better, because they are solid ; but they must be still heavier at a ladies neck.

P. Are those pearls also, those small red beads which ladies wear about their neck, and some of which are not round ?

M.

M. All pearls without exception must be of the most beautiful white. What you mean, are corals.

CORALS.

CORAL (Plate V. fig 6.) is a kind of shell, formed by very small worms with feet, or polypuses, and was long taken for a sea plant, which became hard on being exposed to the air; for in fact coral forms into a kind of stalks and branches, but has no root; and is found firmly attached by its base to the rocks, and to all kinds of bodies found in the sea. Some very beautifuls coral are found in the Mediterranean; but they never exceed much the height of one foot, nor the thickness of one inch. Polypuses of this class form by degrees a house for themselves with their spit, like other shell fishes, and never leave it. Small apertures are sometimes perceived in them, through which they stretch out their legs, which have been taken for flowers, in the shape of stars. But they take them in suddenly on being touched, or if the coral be taken altogether out of the water. They seem even to die instantly, or very soon after. All kinds of pretty little trifles are made with corals; some are yellow, some white, some red.

SPONGES.

COULD you have believed that these substances which absorb water so readily, and which are
so

much in use for that purpose, were also a house, a large building constructed by and for an infinite number of small worms or polypuses, much in the same manner as those above-mentioned form coral? Nothing is more certain however. Every one has its small cell apart, and the whole is formed of filaments closely interlaced, forming often a pretty considerable mass, but very light.

P. Are these then the famous polypuses you mentioned before?

POLYPUSES.

M. THE name polypus signifies an animal with many feet; so that you see in this way, there are many other polypuses beside such as are found in sponges and corals. Notwithstanding, this name has been given in particular to small worms, of which there are a great many species, which have their body membranous and tubular, and terminated by filaments that are susceptible of separate movements, and serve for feet or arms, so that they have rather the appearance of plants than animals, and in reality have been ranked in a class by themselves, under the name zoophytes or animal plants. This resemblance is still more striking from the singular phenomena presented us in their structure, their multiplication, their manner of living.

P. And where are they found? how are they taken?

M. They are found in ponds and in all calm waters that are fresh and not stagnant, where they attach themselves to water-lentils, and many other plants. To get them, we have only to
take

take the plant to which they adhere, and put it in a glass of pure water. In a short while we are sure to perceive them, to see them move, and perform their different evolutions. There are some yellow, brown, green, and red; the different species too receive names analogous to their figure; for instance, there are polypuses with tufts or plumes, as at fig. 8. Plate V.; polypuses with arms, polypuses with horns, fig. 7. &c. The nosegay polypus is the most remarkable of all, because it is a mass of polypuses tied together like a nosegay, at the end of a common canal, to which they all adhere.

The multiplying of these animals affords the most striking singularity; for the young ones shoot out from the old ones, and grow upon them like branches and leaves upon trees. They appear at first like a button, or nipple, which increases gradually in size, gets arms after some little time, and soon separates from its mother to live by itself. But polypuses multiply also by eggs.

P. But what do polypuses get to eat?

M. Vinefretters, worms, which they lye in wait for and seize with their arms with as much dexterity as a spider seizes a fly, or the cat a mouse. It is very entertaining to see a prey fall into the arms of a mother-polypus which carries both her own young and their little ones (for it is remarkable, that the young produce others before they leave the mother.) Then each of the young stretches out its arms to catch it, and when the mother swallows it, it is said, that she robs her own young of the nourishment; and that her young again seek only to rob her of her own. In short, they themselves eat one another, without the one that is eaten dying, for

for it comes forth from the body of the one that had swallowed it as entire as at first.

The last, and undoubtedly the greatest wonder which the Animal Kingdom presents to our view is, that when cut into pieces these creatures do not die, though we should even mince them into ten, or twelve pieces ; but every piece becomes an entire polypus. One sees head, feet, body shoot out, every thing in short that is necessary to a complete polypus. One may even turn a polypus inside out like a glove ; and put one within another, they live as well as ever.

Thus you see that the family of worms in the Animal Kingdom is very wonderful and surprising, though we take so little notice of these small animals. I am now going to speak to you of another class of small animals, which will furnish you with something to amuse and surprize you.

P. I'll wager you are going to give us the history of butterflies and of may-bugs ?

M. That is to say, you have most curiosity about these. Come, we shall find somewhat to amuse us. In the first place, how do we call all these taken together, butterflies, flies, gnats, may-bugs, and others.

INSECTS.

ALL these are called insects, and this name signifies a thing cut in pieces, or at least that presents divisions. For, in reality insects are formed of rings, or segments, one of which is the head, another the breast, though these in

some form but one ; the third is the belly. They have different apertures for breathing, and two antennæ, or moveable feelers which serve them to distinguish those objects which they approach, and the obstacles that are opposed to their progress ; so that they may be directed accordingly, either to advance or retreat, to take the right or the left, to descend or to rise, &c. They have two eyes at least, except the water-flea which has only one in the middle of the head ; generally, they have many eyes. Twelve thousand have been counted in a butterfly ; nor have these eyes an iris, cilia, or eye-lids. They have at least six feet, a heart without auricles and with a single cavity, blood white and cold. Birds, on the contrary, and quadrupeds have two cavities in the heart, besides two smaller ones named auricles, which communicate with the greater.

P. May a person eat insects ?

M. Yes, some ; they are not all venomous. Come, which would you choose, a ragout of may-bugs, or a dish of cray-fish ?

P. And are may-bugs too eaten ?

M. And ants, and bees, and what are not eaten ? There is scarcely an insect that is not somewhere a regale to men. The poor Savages in America feast even on lice and worms ; and as to locusts, some civilized nations eat them with relish ; for instance, in the Levant ; in like manner as St. John the Baptist lived upon them in the wilderness. Custom is every thing, we may accustom ourselves to many things. When one has been brought up to eat raw fish, roots, and bark of trées, and is afterwards forced to live only on white bread, and butter-cakes, it is enough to make one sick of them,

at

at least for a fortnight. You laugh, gentlemen; nothing is more true, however.

P. But have insects flesh too, like fowls?

M. To be sure, they must; their whole substance is only a thickened juice, supported by some membranes, and some cartilages. In the same manner, their blood is not real blood, but only a whitish liquor. They want nostrils and ears, and yet the greater number have an acute smell and hearing. If there be some which do not hear or smell, they are in some measure recompensed by the excellence, and the number of their eyes. Some of them have six, other eight, others ten, twelve, and more, even the length of thousands; a fly, for instance, has eight thousand, and a butterfly twelve thousand.

P. You are not joking, Sir? Is all this true? a fly, four thousand eyes!

M. We shall see them, I hope; and you shall count them. We shall get a good microscope, and you shall trust only to your own eyes. Two very able men have counted them before us, the one called Leuwenhoeck, and the other Swammerdam.

P. But wherefore have flies so many eyes?

M. Try to catch a fly behind----Well, did she wait for you? You must observe that a fly cannot turn its head either to the right, or left, nor raise it, though it can lower it. If it had only two small eyes before, flying every where, and squeezing itself into every thing as it does, it could not live two hours without being crushed to pieces. There is the reason it has so many eyes, which ranged one beside another, form two round eminences on its head to enable it to perceive with ease, attacks from all quarters.

quarters. And the poor bee, who is obliged to go far from her hive, to the distance of a quarter of a league, or even half a league, in quest of honey and wax, among flowers,—how could she keep her course, or shun the dangers of so long a route, if Providence had not furnished her so liberally with eyes? Her journey being finished, she brings her sweet load, to add to that of her companions, almost without making a single mistake.

P. By the way, master, have all insects wings like bees?

M. You have seen lice and fleas, cray-fishes and spiders; you know whether or not these insects have wings. And it is even singular, that an insect without wings is obliged to subsist by catching one furnished with good ones, and that flies well! the spider subsists solely on flies and gnats, &c.

But the wings of insects are made in several different ways. Some have them naked, as flies and butterflies; others have good solid cases to cover them, called elytra, as may-bugs. There are some which have only half elytra, which makes them fly badly, as certain species of bugs.

As to feet, winged insects have commonly six; but such as want wings have more; for instance, the spider has eight, the cray-fish ten, the wood-louse fourteen, another species a hundred and forty-eight, and another near two hundred.

P. Why have not they all the same number?

M. Ah! in that the wisdom of creative Providence is conspicuous. All insects are not destined to perform the same operations. The Creator has been pleased to assign to each its own particular nourishment; and of course, it became necessary that every one should have recourse
to

to different means for obtaining it. Some live in water; others on land; some draw their subsistence from the vegetable kingdom, others from the animal. It was necessary, that some should have feet fitted for digging the earth; and that others should have instruments for perforating wood; that one set should have power and instruments to swim, another long limbs for leaping; that some should have wings, and others a greater number of feet; and all this, not only to procure nourishment, but also to escape an enemy. Some insects are provided with a trunk, which in its small size, is not less admirable than that of the elephant; this, all of them employ for perforating and sucking, some a sweet juice like bees, others different substances. In a word, the instinct and faculties of insects are distributed with so much variety and precision, that when one looks round, and sees such a vast number of animated beings, crawling, flying, leaping, running, gnawing, sucking, &c. one feels impressed with admiration, and veneration at the infinite wisdom of the Author of all these things.----And not a single one suffers famine; each finds what is proper for it; one, roots, another, leaves, some, rotten wood, some, herbs, here, mud, there, earth, flesh, skin, in a word, substances of kinds.

P. But do they never mistake?

M. Never: each knows where to find his appointed food; he repairs to the place, and among a thousand things which please others, selects his own. Suppose his own particular food were to fail, he would rather submit to die of hunger, than meddle with what did not belong to him, that is, with a thing for which he had no appetite. This same instinct, is the oc-

casion that the mother never fails to deposit her eggs in a situation where the young shall find certain food the moment they are hatched ; so that she lives without care in this respect, and without anxiety for their fate. For instance ; some deposit their eggs in the earth, beside a plentiful provision of roots and putrid wood ; others on plants, on meat, on excrements, and other matters. Others penetrate into the bodies of dead animals, as rats, moles, frogs, &c. and there leave their eggs to be hatched. Nor are there wanting some which pierce the leaves of trees, to deposit their eggs ; as the insect which occasions the growth of the gall-nut. Moths come to gnaw our cloths and our stuffs, spin from them, threads of woollen, which they glue together, and fabricate a cover of cloth, if they have spoiled woollen,—or of felt, if they have robbed furs. In this they deposite their eggs, and the larvæ which are produced from them, pierce their covering, eat it, gnaw also the stuffs within their reach, and, of course, assume their colour ; hence we see them yellow, red, blue, &c.

What pains does the spider not take with her eggs, which she fixes betwixt her legs, and drags about with her every where, till they be hatched ?

The bee constructs for herself and her offspring, a beautiful house of wax, with the assistance of her comrades. This large house contains several thousand cells, or hexagonal apartments, which afford a secure retreat for the hatch of the eggs and the growth of the young bees. She farther prepares for them a plentiful supply of honey for their food, laying up a provision for her own subsistance as well

well as theirs, for some months at least, as if aware of the approach and continuance of winter.

The ants labour during summer to amass a store of subsistence for winter ; so that it may be said of insects, that each of them provides for the wants of its offspring, before it has any existence. It is pleasant to observe a mother seek with care a place favourable for depositing her eggs, pleased when she has found it, depositing and arranging her eggs neatly, neglecting nothing that may be useful to them, and having finished this operation, fly away contented and die at ease.

P. But what becomes of these eggs, when it is cold, excessively cold, and every thing is frozen ?

M. Eggs do not freeze, however small they may be ; snow and hoar frosts do them no hurt. They wait the return of the season, and no sooner does the moment for the exclusion of the young arrive, that is, when the heat is sufficient for the purpose, than they make their appearance, full of life and activity.

P. Are there many insects !

M. There are more than fifteen thousand species : the cray-fish is the largest, and the mite the smallest. There are mites so small that they cannot be seen without a microscope, though fifty of them were together ; but there are likewise some which can be easily seen with the naked eye.

P. But how can they exist, or how can we know so much about them, if so small !

M. You know what a grain of millet seed is ? It is not very large ; well, one might see upon it some thousands of this species of insects placed quite at their ease.

Now all these small animals have their limbs well formed, their veins, their stomach, their eyes, &c. All this is distinctly perceived by means of a microscope. Judge now of the infinite power of that Being, who has bestowed on these invisible animals, members, and life, in the same manner as upon us!

P. And where can so many insects lodge?

M. Every thing upon the earth and in the water is full of them. Wherever we go, at land or on sea, we are surrounded with animated beings: Nature every where presents us with an admirable spectacle. Scarcely has the sun gone down, but every thing swarms with them, trees, plants, flowers, meadows, fields, ponds, rivers. Here one beholds an host of flies dancing in the air, there one hears the frog croaking, every where something animated, organized, admirable. Is it possible to be blind, deaf, insensible, in the midst of so many voices which celebrate our common Father?

P. But so many insects must do much mischief every where?

M. In reality, when too numerous, they do us hurt. We need only leave two nests of caterpillars on a tree, to see the whole tree devoured in the space of some weeks. Nor must we neglect to get rid of so many hungry mouths, if we wish to preserve any thing in our gardens. But insects serve for food to birds also and other animals, besides that they prey upon one another.

We ourselves too draw great advantages from several species of insects, such as cray-fishes, bees, silk-worms, cochineals; these last furnish us with the beautiful red called purple: From some we obtain wax and honey, from others silk

silk, and we eat cray-fishes. Thus, you see, in our master's large family, the smallest domestic has his station to fill, his task to perform every year; so that not one is there by chance, or without employment. But as these feeble creatures would be easily incommoded in their labours or enjoyments, by the maliciousness of men or any other enemy, and even their very existence endangered, the Creator has provided them either with wings to fly away, or with arms to defend themselves; as forks, lances, pincers, stings, which they carry in the posterior part of their body. Do you know how painful the sting of the bee is? Some caterpillars preserve their life by their color alone, which resembling that of the plants on which they live, prevents our perceiving them. Other insects escape their enemy by means of a thread which they spin, and to which they suspend themselves of a sudden. Others, by a nimble movement, roll themselves up and suffer themselves to fall like a ball. Some draw in their feet when they are touched; others counterfeit death, and remain without motion, whatever one may do, to rouse them.

Thus, these little animals employ a thousand arts to defend themselves, and deceive their enemies. Often too, when one of them is too weak and ready to fall a victim to its destroyer, its companions come to its assistance. We have an example of this in wasps and ants. These are a race of insects to which we should never approach too near, especially when they have been irritated.

Insects are very tenacious of life; for instance, a fly which has had its head taken off, continues to fly for some moments thereafter, and to get away.

away. Some may be kept six weeks or two months spitted on a pin without dying from it, though they eat nothing; for perfect insects eat very little and drink none, except crickets, which are said to drink freely. Some butterflies have even no mouth, and of course cannot eat at all; so that they live but a few hours, that is, as long as may be necessary for them to couple and propagate. Other insects do not live much longer; some scarcely attain the age of one day. The one that lives longest is the cray-fish, which lives ten or even eighteen years.

P. Is it not true, master, that some insects come from rotten wood, or tainted meat, or other nasty matters?

M. The eggs from which these insects proceed, have been deposited on these kind of matters, as we before observed, because they served to furnish the food necessary for the brood that was to be hatched: But putrid wood or carcasses do not produce living animals. All insects come from eggs which have been hatched by the heat of the air, and from which they are produced by this means completely formed. It is not the insect, however, strictly speaking, or the perfect insect, which comes from the egg; it is only a miserable larva, a poor caterpillar, which has no resemblance to those which have produced it, some of them have feet, others want them. These larvæ must be nourished for some time at the expence of their parents, or at least placed in a situation where they may find sustenance the moment they are hatched; such a nidus does meat and cheese afford. But such as have feet, go themselves in quest of nourishment upon the leaves of trees and on plants of every species, and grow so rapidly,

pidly, that they are forced to change their skin three or four times, because the former one becomes too tight, and of course to renew their age.

During all this period, these little creatures are not insects; but only larvæ, which have nothing else to do but eat, and which in reality consume a great deal when they are numerous any where. Hence they occasion us much damage, when the things they eat, are such as we make use of ourselves. As to the real insects, after they are once formed, they scarcely eat any more, and of course cannot do much hurt; only they incommode us frequently, and deposit every where, the eggs that produce the caterpillars; which renders them justly odious to us.

After the larvæ, or caterpillars, have spent a certain time, eating and feeding together, and the stated period is arrived, that is, when they have finished their larva state, they separate, cease to eat, and think only of finding out some convenient and secure retreat, where they may prepare themselves for the great change which awaits them. They next enter into a state which may be called their middle state, because it is the passage to a second birth. They shut themselves up in a kind of dark cover as in a tomb, and in this state are called beans, nymphs, or chrysalides, according as their covering is more or less transparent: In reality they have much resemblance to a bean. See fig. 18. of Plate III. and fig. 16, 21, and 22. of Plate XII.

P. But they are not dead however during this period; are they, Sir?

M. Oh, no! so far from that, they become more beautiful after this. In the mean time

shut up, and as it were incased in their cover, which is frequently very pretty, they have every appearance of being dead. They continue there, some, two or three weeks, others, a month, three months, six months, ten, and even more, without food. Exposed to frost or even to the heat of boiling water, they are not killed by it; but at the time appointed for their resurrection, they never fail to awaken from their long sleep, and to come forth again to the light, full of life, and under an airy form, adorned with a thousand colours.

P. And then, what do they do next?

M. There remains to them a short but joyful existence, which is occupied with flying from flower to flower, from one plant to another, in enjoying for a short while the air, then in coupling, that they may have eggs which shall produce other larvæ like those from which they themselves sprung; and at last they die.

This is very nearly our own history*.

It is necessary to remark however, that, all insects do not absolutely experience this wonderful, this admirable gradation: some do not pass through these four successive states, of eggs, larvæ, nymphs, and lastly flies or butterflies. Spiders, for instance, on coming out of the eggs, are perfect insects, which suffer no other change but an increase of size. It is thought too, that palmers, wood-lice, and some others,

* This subject undoubtedly affords a fine comparison of the life of man, with that of insects, their operations, and metamorphoses. To such young people as are capable of understanding, it will be proper for the preceptor to set it before them with the necessary precautions: but these are so delicate as to render it improper to attempt them here.

others, are viviparous, and produce at once young like themselves.

P. How ! do flies, butterflies, may-bugs, not increase in size as well as spiders ? For my part, I believed that the large flies had been small ones, which had increased by degrees.

M. Not at all ; each insect, whatever it be, fly, butterfly, may-bug, remains such as it is on coming out of the egg, or from a larva becomes a nymph, and large or small, dies without change. The case is not the same with these insects, as with calves, which become oxen.

But to arrange the whole family of insects in our cabinet of the animal kingdom, it will be necessary to distinguish the different classes or species. We may divide them into seven.

The first, such as have complete elytra, as may-bugs, flying-stags, and others, named coleopterous.

The second, such as have only half elytra, as certain wood-lice, cochineals and others, named hemipterous.

The third, the lepidopterous, that is, such as have four wings covered with scales, as butterflies.

The fourth, the neuropterous, that is, such as have four naked wings, reticulated with veins, without a sting, as the dragon fly, &c.

The fifth, the hymenopterous, that is, such as have four membranaceous wings, and a sting, as bees, &c.

The sixth, the depterous, or such as have only two wings, as flies, midges, &c.

The seventh, the apterous, that is, such as have no wings at all, as spiders, fleas, lice, &c.

But

But instead of these seven classes, it would be shorter to make only three or four.

The first containing such insects as have four wings, or tetrapterous, either with, or without a cover; which might be divided into two.

The second, the dipterous or such as have two wings as before.

And the third, the apterous or such as want wings. Naturalists, however, have arranged insects according to the above method, in seven classes, and all the world has gone into it, to avoid the trouble of forming a new one for themselves. We must also do the same, in order to understand what has been said by others on the subject, as well as to be understood ourselves. Thus I am to begin with speaking to you of may-bugs, or rather scarabæi; for scarabæus is the generic term, or name of the genus of which may-bugs is only a species; we shall next speak of each species of the scarabæus; all these are of the first of the seven classes.

SCARABÆI.

THE insects distinguished by this name, have six feet and two thin transparent wings, covered with two cases, or elytra of a solid substance like horn. They are produced from larvæ which have six feet at the anterior part of their body, and which pass the greater part of their life in the earth, in dung, in wood, or in water, subsisting on leaves, roots, rotten wood, the dead bodies of rats, mice, serpents, lizards, frogs, toads, and other filthy matters. In reckoning

coming from the egg state to that of scarabæus, they live some months or a year, or even the length of five years, in the earth, in bark, or in dung. They change their skin several times; and during winter, they dig a retreat for themselves in the earth at such a depth as secures them from frost, and there continue till the heat of spring calls them again into light.

These are the operations of scarabæi every year, till at last on the arrival of some harvest, they shut themselves up in a hole of some clod of earth, or in a piece of rotten wood, or in dung, or in a leaf; and there changed into nymphs, they wait till the returning spring quicken them into life, under the form of scarabæi. They leave their holes by degrees, fly about, copulate, lay their eggs, and then terminate their existence, if not previously devoured by birds.

To accomplish these operations, the winged insect lives sometimes a month or two, as the may-bug, or may-scarabæus, so called, because this is the month in which it commonly exists, sometimes in June, or sometimes from spring to autumn, and sometimes, in short, two or three years.

Some scarabæi have one horn, others two, others three, and others want them altogether. Among several species the males only have them, or at least, the females have smaller ones, as may be observed in the stag-beetles.

They are of different colours too, some are black and brown, some blue and grey, yellow, red, and variegated. They differ also in point of size, for some are not larger than the head of a small pin, as the earth plant-louse, and others.

others which are as large as sparrows, as the American scarabæus, or elephant.

P. Are there many species of scarabæi?

M. Yes, undoubtedly, above eight hundred have been reckoned, which are named differently according to their shape, their colour, their abode, their food; for instance, the stag-beetle, the dissectors, the fullers, the rhinoceros, may-bugs, gold-beetles, buprestes, or cow-burners, cantharides, capricorns, &c.

P. But how shall we do to know them all? For as yet we know only the stag-beetles, may-bugs. . . .

M. Ah! especially our dear may-bugs, to which we so often return, and which afford us so much amusement! but I am happy you know them so well; for I shall beg of you to give me their history in your turn. Every one must tell what he knows; as to myself, you see I tell you all that I know.

P. Ah! Dear Sir, it is very true; but you will explain that better to us than we can.

M. It may be so: at most I shall be able to teach you some other terms, which you have not yet had occasion to learn. Then speak always as you have a mind.

MAY-BUGS.

P. Well, may-bugs have on the back, two wing-cases which are of a kind of red or brown colour, and hard; and underneath, two wings as thin as fine paper, very fine, so fine that one may see through it. Then they are black under the belly, with white lines and spots upon the sides.
They

They have six feet and two horns, and round the neck a collar of black horn. They have also hooks at their feet to fix themselves by, and their eyes are black and sparkling like little diamonds is it not as I have said?

M. The whole is true, very true; the only thing to be noticed, is that naturalists instead of speaking of wing-cases, say elytra; instead of saying one may see through, they say diaphenous or transparent; the horns, they call antennæ. In the same manner they would have begun with saying that may-bugs are of the genus of scarabæi. Nothing remains, after what you have said, but to speak of the shape of the larva of the may-bug, of the time it continues, and other particularities which characterise this family. I shall mention to you what I know of them. The may-bug, which is also called humming scarabæus, comes from a larva, (Plate VIII, fig. 35, and 37.) which is produced from eggs placed deep in the earth about the month of May, according as the season is more or less forward. This larva remains in the earth at different distances from the surface, three, four, or five years, under the name of a white worm, where it subsists on the roots of plants. The young may-bug comes out of the earth in the month of May also, flies away, and gnaws the leaves of plants which it reduces to powder; which has obtained it the name of the miller, in certain countries. They afterwards couple, and remain long fixed together, two and two: after which the female digs the earth to the depth of a fathom, prepares a commodious place for herself, and there deposits her eggs which are of a light yellow,

yellow, and an oval figure. She then leaves the earth, lives a few days, and then dies.

Frequently the may-bug completely formed continues a whole season in the earth, and does not leave it till the spring succeeding that in which it left its larva state. Some also after having lived a summer, sleep in the earth during the following winter, and come forth again to enjoy the pleasures of life. So that a may-bug may live two years, or at least two summers; for no body has yet observed any of them live twice through the whole four seasons of the year. Some others of the scarabæi, as the monoceros, have been observed to retire into the earth for a whole winter.

May-bugs never appear before the month of May, and commonly not till later, because they are much afraid of cold. Nevertheless they are equally afraid of much heat, and for that reason, during the heat of the day, they lie concealed under the leaves, and come out only towards the evening when the heat has abated. As this is the season we make choice of for walking, we amuse ourselves sometimes with running after them to catch them.

The male, (Plate VIII. fig. 39.) is distinguished from the female, (fig. 38.) by the tufts which terminate the antennæ; for besides those of the female being smaller, she has tufts only at six plates, whilst the male has tufts at seven. Others even say that the female has no tufts. When the may-bug flies he displays his tufts. Birds are very fond of them, as well as of their worms or larvæ; hogs too, eat them readily, as also do fowls, especially turkies.

THE

THE SUMMER-BUG.

THIS has a great resemblance to the may-bug; it differs in being less, of a pale brown, without the tuft on its antennæ, which terminate in a kind of button. It does not rest upon trees, nor upon bushes; it flies only during the day, though sometimes it roams too at night: it subsists on grain. It has six hairy legs, one pair of which is always larger than the others, (See fig. 7. Plate VIII.)

THE GOLDEN BEETLE.

THE splendid and incomparable insect of this name, observes no very exact period in leaving the earth or other places where it remained in its larva state, as the old hollow trunks of trees, or ant-hillocks, because it lives on rotten wood, and the nymphs of these insects. The golden-beetle, (Plate VII. fig. 33.) is nearly as large as a may-bug, and resides much on the white tufts of elder flowers, on narcissuses, lilies, and roses. With soaked bread and fruit, one may preserve a golden-beetle alive two or three years.

P. And may-bugs likewise?

M. Alas, no! the dear may-bug cannot be accustomed to such a regimen; but the golden-beetle is much prettier, so that one may well spare the other.

P.

P. But it will not do the same thing which the may-bug does, which flies when we wish it, as soon as we sing a little song to it; whilst the other instead of flying or running, do what one will to rouse it, draws in its head and legs as soon as one touches it, or wishes to make friends with it, and counterfeits death.

M. Well then, let us leave this uncomplaisant beetle; here is another with which you are not acquainted perhaps.

THE RHINOCEROS.

THIS name signifies horned-nose, because in reality this animal has a horn on the fore part of its head, and it is also called monoceros, because it has only one; this it possesses in common, with a large quadruped which bears the same name. It is, as you see, (Plate VIII. fig. 31.) two or three times larger than a may-bug, and resides in rotten wood, but especially in old hollow oaks, or in tan-pits filled with the bark of that tree. It can, like the may-bug, lie concealed during winter, and appear again in spring with its young companions. One of them has been known to conceal itself behind the wainscoating of a room, where it has been heard gnawing the timber during the whole winter, whilst it could not be imagined what it was, till the month of March when it left its concealment, and was endeavouring to regain its liberty; but was retaken and condemned to death as a deserter, to be sent afterwards to ornament

namement the cabinet of natural history belonging to the house.

As to beetles with three horns, they are only found in America, and especially in Brazil, where they are larger than our flying stags. They have horns however pointed forwards, and turned in sometimes upon one another, sometimes beside one another, like the claws of the cray-fish: they get the name of Hercules, or elephants, or flying bulls.

THE DUNG-BEETLE.

THIS, like other beetles, proceeds from a larva, and this larva resides in dung, where it continues at most one year. There are several species of this beetle. Some deposit or rather scatter their eggs on the dung of horses, cows, or sheep. Others make a sort of small balls of it to inclose their eggs in. Ours, represented in Plate VIII. fig. 17. is of this last species. It flies up and down, and creeps into the dung of cattle, especially of horses. Having fixed on some portion, it then makes a hole in the earth, introduces the portion of dung, which it had formed into a ball, deposits an egg upon it, returns for some more dung, and then flies away to do the same in ten other places, or even more. After some days the larva is produced and subsists on the provision made for it by its mother. This provision lasts till the spring; then it changes its skin four times, and at last becomes nymph, to pass into the state of beetle.

We have in this country, as well as in several other countries of Europe, a beetle with
one

one horn, which is nearly as large as the dung-beetle, and which also resides much on such dung as it finds in meadows and fields, on which too, it deposits its eggs in balls of cow-dung.

THE CAPRICORN.

WE distinguish by this name, a species of beetle that has jaws strong enough to gnaw wood both green and dried, and furniture that is made of it, for the purpose of depositing its eggs. From these eggs larvæ are produced which want feet, and which penetrate wood, as well for lodging as for subsisting themselves till they undergo their metamorphoses. In some countries, this beetle is called the buck of the wood, or the goat of the wood, because its horns are bent like those of this animal. Many of them, both large and small, are of a black colour, brown and speckled; and all of them are so tenacious of life, that they may be kept alive more than six weeks impaled on a pin, and without food. A large one is represented in (Plate VIII. fig. 30.) and a small one in (Plate X. fig. 6.)

By the way, are you fond of nuts? There is no reason to doubt it; but have you never observed in opening them, a kind of worm large enough to fill a considerable part of the shell? Well, this is a larva from which is produced a beetle with a trunk.

THE

THE NUT-BEETLE.

ABOUT the month of August, and sometimes later, this beetle makes a hole in the nut, whilst it is still green and soft, both of the common wild hazel, and also of the garden filbert, and in some other species; there it deposits an egg, from which at the distance of about fifteen days issues a larva which feeds on the kernel. Having devoured this, it comes forth in autumn, digs a hole in the earth, and is there converted into a nymph, and after winter into a beetle; such is the nut-beetle, (Plate VIII fig. 41.

THE BEETLE WITH A SPRING.

It is small, thin and long, and remarkable for a spring, by means of which it can throw itself into the air, when lying on its back. This spring is the point of the corselet which gets engaged in the belly, and then gets free with force, which throws up the insect, which commonly lights again on its feet. There are several species of this.

THE FLYING-STAG.

THIS insect is produced from a larva which passes six whole years gnawing rotten oak before

fore its transformation into a beetle; after which it does like the rest of the the species, that is, flies about for a few days, copulates, lays eggs, and dies. The reason of their being seldom seen is, that they remain constantly and solely in oak forests, and that in the two months June and July; there it is they both live and die. They eat the leaves, or rather they suck their juice; but they are fond of honey, and if you would have one of them follow you like a dog, you have only to give them some when you have taken them.

P. Oh! I am glad to hear that; they will work much better when we make them draw a cart, and put them in the yoke like oxen. And when we shall have yoked one, and two shall not be strong enough, we will go in quest of some more quite fresh from the stable, to yoke in along with them.

M. But take care of the jaws.

P. Are not the females smaller than the males?

M. Yes, undoubtedly, and their horns are smaller likewise. We may farther remark, that their horns are moveable, and may be brought into contact; whilst those of cattle are immovable. This beetle is also called the flying-bull or the flying-ox, on account of its being a great deal larger than the other species of these insects. The mouth is situated betwixt the two horns; it is surrounded with four yellowish tufts, which represent the tongue, or rather the trunk for sucking with. Near these, are situated two others that are smaller, along with two pretty large jaws; close to these are its eyes, beside which it has four long antennæ divided into four plates. The elytra are generally

rally of a clear brown, and sometimes of a dull red. (See Plate VII. fig. 28.)

THE GLOW-WORM.

THIS is a pretty little beetle, remarkable for the light which it emits during the fine nights of summer. The male is furnished with wings, but the female wants them; she is rather smaller than a coccinella, and of a brown colour. Her body is formed of ten rings, of which the three lower are yellow, and afford a light in the dark. The male is smaller and almost completely black, and gives likewise a weak light at night.

THE GRAVE-DIGGING-BEETLE.

THIS beetle is produced from a larva which remains six weeks or two months in the earth, beside the carcase of a rat or toad, a frog or a mole, on which it subsists. When the insect is about to deposit its eggs, it flies about from one place to another, till it find some such carcase, when, if it be pleased with the smell, it delays no longer. It then buries the eggs; and when some days have elapsed, the larvæ come forth, which by this precaution are provided with fresh meat, for they live on no other thing. But for the care which the insect takes to bury their provision, the carcase would be dried by exposure to the air, or carried off by

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other animals. The difficulty, however, consists in raising the dead body, and carrying it to the place where it is to be buried; for the mass in question is always a hundred times larger and heavier than the small insect. It calls in its companions however to its assistance. If there be only two to remove the mass, the labour is arduous, and goes on slowly; but if a third, a fourth or more arrive, there is no carcass of a rat or mole, which they will not remove in two hours labour, or in double that time at most, and bury in such a manner that the place shall not be distinguished. The insect also takes care to make choice at first of a place proper for interring the prey it has discovered. If the earth be loose enough upon the spot, it goes no farther; but if it be a hard rocky soil, or too shallow, it carries off the carcass to a situation where it may place its posterity in safety. If it be the carcass of an animal that is too large, as of a cat, for instance, or a serpent, it cuts it into pieces, and takes no more of it than is necessary for the subsistence of the larvæ, which are to be produced from its eggs, and which are commonly twenty or thirty.

This is an amusement we may get in the garden. We have only to lay in a corner some small carcass, and to watch the grave-diggers from the month of May to that of August. Four days will scarcely pass till we shall see them arrive; and if we dig up the carcass, they will not fail to proceed to a second interment.

COCCINELLA.

COCCINELLA.

THIS is the beetle which you know so well by the name of God's beast, or cow, (see Plate IV. fig. 18.) and without doubt you have named it thus, because it has never done you any harm, besides, that it is very beautiful on account of its fine colours. On the contrary, it is of great use to us, by devouring the lice which destroy our flowers, and the leaves of our pot-herbs and others.

DERMESTES.

THIS beetle is also called dissector, (Plate VIII. fig. 32.) because it falls upon carcasses during the night, and likewise devours meat, or bacon, whence in certain countries it has obtained the name of bacon-eater, for it introduces itself with much dexterity into the larder, to which it is attracted by the smell of meat. There it deposits its eggs on a piece of bacon or fat, and the larvæ which after some time are produced from them soon consume the provision. Having attained their full growth, these creatures retire into some corner of the chamber, or into some chink, between the boards, and are there changed into beetles. There are several species of them, both large and small, brown, grey, and black; the one that is best known, is black, with a grey stripe on the back, spotted with black spots. (Plate X. fig. 25.) The larva

of this insect penetrates easily through the thickest hide, furs, covers of books, and the books themselves.

What is most singular in the dermestes is, that as soon as one touches it ever so lightly, it counterfeits death, and does not stir whatever one may do to it, as pulling away its legs, or antennæ, one after another, pinching it, burning it. Perhaps the touch of a person occasions a kind of fainting in it; but it is certain at least, that if suffered to remain at rest for a little, it does not fail to make off, either by running, if its legs remain, or by flying, if it have only wings.

THE EAR-PIERCER.

THIS, which has also been named the ear-wig, is one of the most defamed of the beetle tribe, because it is pretended that it penetrates into people's ears, and plagues them much; it is likewise one of those that are best known. It lives in fruits, flowers, and especially in turnsol; but it deposits its eggs in the bark of trees, or in the earth among stones. The larva comes out of the egg of full size, and it is only after having changed its skin four times, that it becomes a winged beetle. It is represented in fig. 29. Plate VII.

P. But does it not go into people's ears, and do mischief?

M. It enters them, as lice or other insects do, by chance, not from taste, or that it seeks out this retreat; besides, our ears secrete a kind of bitter wax, which insects cannot bear, and which disgusts them as soon as they enter.

Thus

Thus it has happened, without doubt, because some one has by chance found its way into the ear of a person, while lying on the grass, or otherwise, that this name has been given to the insect: which would have a much better opportunity of penetrating the ears of cattle, if it were thus instinctively directed. In reality, there are some instances of an ear-piercer entering the ear, and which has penetrated even into the head; but this is a very rare occurrence.

THE BOOK-WORM.

THIS is one of the most noxious of the beetle tribe; there are different species of it, all equally voracious; against whose destructive ravages nothing can be safe, dried plants, herbs, insects, birds, fishes, books, tables, moveables, &c. It gnaws every thing, penetrates every thing, and spoils every thing, for the purpose of making a deep hole, at the bottom of which it deposits its eggs on a bed of down, formed of materials which it has gnawed. It is particularly to be dreaded for books, archives, and collections of insects; and its operations are so much the more difficultly prevented as it is not larger than a louse. You will find one represented larger than nature, in Plate XII. fig. 17. Among these plunderers, some prefer furs, skins, &c. others, paper, books; others stuffs, cloths.

SPANISH

SPANISH-FLY.

It is likewise called *cantharis*: the other name of this beetle is taken from its resemblance to a fly which is very common in Spain, whence we became first acquainted with it. These insects are found in great plenty, however in France, as also in Germany, Holland, and other places. The *cantharides* are long and round, of a beautiful green colour, shining like gold,—which are employed so much in medicine; they are dried, then pulverised, and mixed up with oil and tallow, in the form of an ointment, of which plasters applied to the skin, occasion blisters filled with humours, that are by this means expelled from the body which they incommode.

CASSIDA.

THIS beetle derives its name, which signifies helmet, from the edge of its corselet protruding forwards, in such a manner as to cover its head like a helmet. It likewise draws in its claws and its whole body, when frightened, which has procured it in some countries, the name of the flying tortoise. It has two red spots in the middle of its back, and haunts meadows, thickets, bushes, &c. See Plate VII. fig. 36.

EARTH-

EARTH-FLEA.

IN Spring, one observes these creatures leaping every where on plants, of which they devour the young buds ; they do infinite damage to young shoots of every kind, and are of the genus of wood-beetles, certain species of which are scarcely so large as a third of a flea, whose name they have got, either from their smallness, or because they imitate their manner of leaping.

WATER-BEETLES.

THERE are likewise an host of insects of this species in ponds, basons, stagnant waters, pools, even rivers. Some are large, some small, some black, and some brown, all of which have the head flat, long pincers, four antennæ, and six feet, of which the two hindmost are much larger and longer than the others, because they use them as oars for swimming or rowing in the water.

The hydrophilus among others, is of a greyish black colour ; its elytra are marked with narrow yellow lines, and it continues the whole length of Summer in ponds and basons, or in waters that have a gentle current. Its larva sails about in the water, till the period of its metamorphosis ; then it gains the shore, digs a hole in the earth, and retreats thither to take the form of a beetle ; after which the insect flies away. The elytra of the male are perfectly flat, and of

a blackish-brown, very brilliant. When the female, (Plate VIII. fig. 15.) is about to deposit her eggs, she seeks a piece of wood, a large leaf, or some other thing, lays them on it, covers them with fine soft brown threads, and leaves them at the mercy of the waters, till the larvæ are excluded and leap into the water. They swim rapidly, dive well, and generally exhale a disagreeable ardour.

BUPRESTIS.

THIS name signifies cow-burster or cow-inflater; thus, the beetle which bears it, is rather a terrestrial than an aquatic insect; and in reality, sheds an acrid fluid, stinking and venomous; which injures cattle when they chew it, feeding in the fields where the the buprestis always haunts. But this disagreeable odour will occasion the same name to be given to some of the species of water-beetles, which resemble this likewise very much in colour; for they are richly gilded and very brilliant, both the one and the other, so much so, that savage nations use them for ornaments.

LADY-BEETLES.

SOME of these are aquatic, and some land, and of both there are several species. You surely are not acquainted with the beautiful lady-beetles that are seen flying on the waters, which

which have a body long and bluish, brilliant and very supple, with a large head, and four very transparent wings, and which fly very gracefully, whence they have probably obtained the name which they bear. For it would not be very polite to say the name had been given them on account of an organ that is very singular, and even unparalleled in nature, with which the nymph of this beetle is provided, to wit, a mask, in some measure resembling an helmet; this mask conceals a traiterous mouth furnished with good teeth, and the nymph raises it at pleasure, to seize those small insects which had approached too near, whilst they perceived the mask down.

These nymphs, after being for a while, small worms with six feet, live in this situation ten or twelve months under water before they are transformed into beetles. They then leave the water and glue themselves on some plant, where the metamorphosis takes place.

The land species of this beetle are equally curious, but we must wait till we catch some of them, in order to observe the manner in which they employ their address.

We have only discussed the first of the seven classes of insects; they will occupy us a long while, if we do not make haste to treat of the second.

II. CLASS OF INSECTS.

THE insects of this second class are characterized by having the head inclined towards the breast, by being armed, some with jaws, others with

with a trunk, and by having mostly four wings, which do not meet in a straight line, but are laid over one another, and partly covered with half elytra or cases. Some species have only two wings, and some want them altogether.

PLANT-LICE.

You are undoubtedly acquainted with a class of insects so extremely numerous: for we frequently find flowers, for instance, roses so completely covered with them, that it is impossible to touch them; they pierce the leaves like a sieve, they eat the buds, they devour the whole.

There are a great many species of these insects, and all of them, in shape and size resemble a louse; but you are perhaps not acquainted with them by the name of wood-lice. All of them have a small head, a sharp rostrum, two eyes, two antennæ between two others, six feet; and their colour is black, green, yellow, red, brown, white, according to the trees and plants on which they subsist, and on which they are always found collected in families.

Country people frequently mistake plant-lice for a disease of the plants, a kind of mildew, because they devour them so rapidly, that one has scarcely time to observe them; and the plants thus attacked and injured in their growth, or in the parts of fructification, continue barren and die. One frequently finds leaves of plants folded together and filled with a family of plant-lice, covered with a kind of froth, which is
emitted

emitted by the females, when depositing their eggs.

Plant-lice have commonly wings, but not always, whether male, or female. Such as possess them fly from plant to plant in harvest, and seek to couple. Scarcely any insects multiply so astonishingly as plant-lice: a single one in the space of fifteen days, produces at three or four births, several hundreds of young, completely formed, which in a few days afterwards bring forth others in their turn; and this continues through the whole summer. In harvest they take care to lay a prodigious quantity of eggs, so that after the winter, we may have all at once, a plentiful provision of these ravenous guests. In the space of fifteen days they change their skin three or four times, growing a little larger at every time, and after that they instantly die.

The males are evidently smaller than the females, and are also fewer in number. Thus, as we have just seen, these insects, after coupling, sometimes lay eggs, sometimes bring forth living young; and it is a singular exception which the Providence of the Creator has made from his apparent rules, in favour of an animal so contemptible in our eyes, as the plant-lice. But he has seemingly made choice of this species on account of its diminitiveness, to give us a specimen of the wonders of his infinite power in the production of animated beings; and in reality we know no other such striking example of such a wonderful multiplication, since each female plant-louse, at one single copulation, is impregnated even to the fifth generation, and in an instant finds herself mother of about four thousand offspring.

Another singularity not less remarkable, is, that the males do not impregnate the females for every time they bring forth young; they copulate only in autumn, and from this moment the female is impregnated for the whole of the ensuing summer. Further, the eggs which these insects lay in autumn, contain the young plant-lice completely formed, so that in spring, as soon as the buds begin to appear, these merciless gnawers have only to quit their shell on the instant, and fall greedily upon every thing that grows. It is true, they are eaten in their turn: ants make great havock of them, and bees are no less fond of them, on account of a sweet juice which they afford; without doubt there are many other insects, as well as birds and animals which prey upon them.

GALL INSECTS AND PRO-GALL INSECTS.

THESE insects derive their name from the resemblance they bear to gall-nuts, for which they may easily be mistaken; for the female at least, carries a kind of round shell on her back, which has procured her in some countries the name of louse with a shell: as to the male, he is winged, and resembles a fly. There are several species of them, all of which live on trees and plants, of which they suck the leaves without gnawing them. This, however, injures the vegetable so much as to occasion its death.

Nearly allied to this species, is that of the pro-gall insects, which have a great resemblance to the former, but still possess distinct characters

ters of their own; of which the principal one, is that they pass the greater part of their lives glued to the bark of trees, without making the least sensible motion, so that they must be viewed with a microscope, to discover that they are animals.

Of all the species of gall-insects and pro-gall insects, such as most claim our attention, are those from which we obtain the beautiful red colour, which we have substituted for the purple of the ancients, to wit, kermes and cochineal.

KERMES.

THIS gall-insect is found in France, and especially in Provence, upon a species of small green oak, of which it sucks the leaves. In shape, it resembles a small ball having a piece taken out of it. The female lays eggs smaller than poppy-seeds, filled with a fluid of a pale red. The male which resembles the female in his first stage, finishes by a transformation into a nymph under a shell, and he comes forth with wings under the form of a small midge. These insects are gathered before their metamorphosis, and sprinkled with vinegar, which gives them a red colour, and are then used for the purposes of dying. They are also used in medicine, but differently prepared. These are what are called grains of kermes.

COCHINEAL.

COCHINEAL.

THIS is a grain very much resembling that of kermes, when it is dried, and of the same nature, that is, it is merely a pro-gall insect, collected in the same manner, for the precious dyes of scarlet and crimson. This insect is found only in Mexico in America.

THE BUG.

THERE are a great many species, which are divided into several classes, to wit, house-bugs, earth-bugs, wood-bugs, and water-bugs. All of them resemble much the beetle, but they have not all wings; besides they undergo no metamorphoses, and preserve the same figure they had at birth, save only that several get wings at the fourth change of their skin.

The house-bugs or bed-bugs, (Plate VIII. fig. 2.) are insects of a reddish brown, nearly of the size and shape of a lentil, exhaling a most disagreeable odour, when crushed, and which remain in beds and such other warm places, whither they are attracted by the smell of the human body. The chinks of boards or their joinings serve for their retreat, during the day; but as soon as a person is laid down, and the beds are warmed by the people in them, the bugs leave their holes, and come to suck the blood of their prey. Their bites are so uneasy,
as

as frequently to deprive one of rest for the whole night.

P. But bugs have no wings?

M. That is true, you have observed accurately.

P. Oh, I know well the means to get rid of them; I observed how a neighbour of ours did with his house.

M. Well, it will be a service to relate it to us; we may some day have occasion to use it.

P. He first had the leaves of walnut tree boiled in water, and then the bed-stead well washed with the decoction.

M. You are right; I have seen the same thing done myself; but you have forgot to tell us the proportions of the water, and the leaves that ought to be employed: there should be about two handfuls of the leaves of the tree, or of the fresh tops to a pint of water, to be boiled for half an hour, and afterwards strained. This decoction banishes bugs for ever. One may get rid of them well enough too by vitriol, and likewise by the leaves and flowers of lavender. One may destroy the whole race of them also, even to the very eggs, by using a thin plaster of lime newly slaked in some alum water, and applied hot*.

Earth-bugs live partly in gardens, where they attach themselves to the different species of gooseberry-trees, partly in woods, on the trunks of trees, partly in pigeon-houses, and in all sort of holes. They are likewise of a round figure, small, and partly winged.

Wood-bugs resemble in colour, the bark of trees, which makes them easily elude our sight.

Bugs

* All drugs of a strong smell, expell bugs; for this reason, they are never seen in apothecaries shops, nor in those of carriers.

Bugs are of many colours, green, yellow, red, black, whitish, bluish, gray, spotted, &c. but all of them have an insufferable smell.

Water-bugs live in stagnant waters, where they subsist on gnats and other small insects, which they seize swimming on their backs, so that one seldom sees them in another posture. The prick of their trunk for sucking, is painful. Their eggs are deposited in the water, where they remain a long while before the young come forth. You see one in Plate VIII. fig. 4.

THE WATER-SCORPION.

THIS aquatick insect resembles much, as you see by Plate VIII. fig. 5. the water-bug; but what has procured it the name of water-scorpion, is its two pincers or anterior arms, which resemble those of land-scorpions. The trunk in the tail only serves it for breathing through, and not for piercing. There are two species the largest of which, is only found in America.

GRASSHOPPERS.

GRASS-HOPPERS and crickets make but one family, because both species are furnished with a pair of long legs for leaping with, both live on grass, leaves, grain, barks, and roots, dwell in the earth in small holes, and the males of both, make a similar noise with their upper wings or elytra. Plate VIII. fig. 8.

Grass

Grasshoppers seem to derive their name from their manner of going, which is rather by bounds and leaps, than in any other way, though they possess legs and wings. They all die before winter, but the females leave eggs in the earth, from which are produced in the spring, without metamorphosis, young grasshoppers completely formed, excepting only that they want wings, which they do not get till the fourth time of changing their skin. Then these destructive insects become still more dangerous.

P. But what is it grasshoppers injure, by eating grass?

M. In our temperate climate, and in countries that are still colder, they are commonly neither very numerous, nor very destructive; but in warmer regions, as in Turkey, Hungary, Poland, and in Africa, &c. the locusts, which form one of the tribes of this genus, are so numerous, that they resemble armies; they rise into the air like large black clouds, and cover the fields where they halt, to the depth of three or four feet. Judge how many millions there must be! But what is most terrible, is, that they destroy every thing, eat up grass and herbs, and leave the earth entirely robbed of harvest, fruits, and every thing that vegetates; so that they frequently occasion famines; and their carcasses, when they perish by rains or otherwise, send forth an insupportable stench, and produce pestilential diseases.

It is true, when they do not come from abroad, people, may by care and attention prevent their ravages; thus, in some of the Austrian territories, whole regiments of soldiers, accompanied with some thousands of peasants, are sent in quest of their eggs in May, June, and July, who have gathered

thered and burnt them, sometimes to the amount of two hundred bushels. The same thing also happened in France, at the beginning of the last century, when an host of locusts having crossed the sea, to settle on Provence, the inhabitants preserved themselves from their posterity, the ensuing season, by destroying their eggs, with which they filled holes made in the earth, in the form of trenches. Into these were put above three thousand quintals; which would have produced a frightful quantity of these animals. Thus, the inhabitants of those countries which are most frequently visited with them, consider them as a scourge from Heaven, as a plague or punishment. . . .

P. Ah! dear Sir, is that what we read of in the historical part of the Bible, where the plagues of Egypt are mentioned.

M. Exactly; and sometimes it happens that these horrid insects even enter the houses and destroy every thing within, gnawing even to the very door. Besides, these locusts are larger than those of our country. Farther, the natives eat them in these countries, and thus, as you have already seen, St. John the Baptist eat them with wild honey. There are whole nations who make them a regular article of diet; formerly they were carried to market at Athens, and we see that Moses allowed the Jews to eat four kinds of them. It is pretended that they become red by boiling, like cray-fishes, and that their flesh is white, and of an exquisite flavour. Are you not seized with a desire to have a ragout of them? It is true, we have not, in this country, this fine species of large locusts. . . .

Locusts are quarrelsome, they fight with, and frequently eat one another.

CRICKETS.

CRICKETS.

CRICKETS are divided into two classes, field-cricket, and house-cricket.

These last inhabit warm places, as the holes of ovens, hearths, kitchens, and subsist on whatever they can find to their liking, as crumbs of bread, and grain of different kinds, &c. They are of a yellow-brown, have four long slender antennæ, four pincers that are shorter, two bristles at the tail, where the females have likewise a very hard sting, which serves them for inserting their eggs into the earth, where they are to be hatched; and lastly, four wings of which the two undermost are longer than those that are above. See Plate VIII. fig. 34.

The noise that is made by the male-cricket, or his singing if you will, seems to come from some other source than the flapping of his wings, as is commonly imagined. They have, like the locusts, an organ in form of a drum, under their wings, from which this kind of voice is produced.

P. Oh, I should like to see it! I will catch one in our kitchen, where there are a great many which sing at night, for we have got an old cook, who says, that this bodes luck to the house.

M. Well, the whim of this good woman is of use to us, by furnishing us with an opportunity of examining the organs of this insect.

P. But we have likewise an old servant who says, that when the crickets chirp in a more slow

slow and dull manner, it is a sign that some of the family are to die.

M. Very well, it must have been an old woman indeed, who could tell you such a story; for I am sure none of you ever heard a man, however ignorant and foolish, say such a thing. Nevertheless, insects are sensible of certain changes in the air, which we ourselves do not perceive; for instance, a little before we are to have rainy weather, they chirp stronger and with more vivacity. You will find some difficulty in catching one of them; for they run very fast, and only leave their holes during the night, in quest of food; the only way of bringing them out, is to fill the place where they are with smoke of elder; they then become in a manner intoxicated. and suffer themselves to be taken, or soon die.

Some Africans purchase them for keeping in a kind of cage, and are entertained with their music. Field-cricketts inhabit the meadows and pastures, where they subsist on roots, moist grains, and other similar matters. They resemble the house-cricketts, saving only that they are of a browner colour. Both kinds drink readily, the former of whatever may happen to be spilled in the kitchen, the latter, the dew of plants.

There is another species of field-cricket, called cricket-mole, or mole-cricket, known in France by the name of *courtilliere*, which is thicker than the house-cricket, and of the length of a finger. Its two fore feet resemble those of the mole, or the claws of the cray-fish, so that in some countries it has got the name of the land-cray fish. It makes a noise like the common cricket, and digs like the mole. It devours the
culinary

culinary plants in gardens, and is very destructive among fields of barley ; gardeners are at as much pains to destroy it as even the moles. The mole-cricket does not get wings till nearly two years after its exclusion from the egg. It constructs its nest with peculiar care. Birds, lizards, moles, prey upon crickets.

There is yet another species of cricket, which has much resemblance to a grasshopper, leaps like it, walks ill, but flies well ; for it has beautiful wings like a butterfly, and which it folds up close under its elytra. It also eats herbs, and sometimes makes great havock.

MANTIS OR SOOTHSAYER.

THIS insect approaches in its character to the grasshopper tribe, and has obtained different names. In some countries, it gets the name of the walking leaf, which it has obtained from the frequent variations of its wings ; for at first, they resemble a green leaf of a willow, then a dried leaf, and lastly, a withered one. Perhaps too, it may have got this name, because at its birth one would almost say it was the leaf of a tree which was about to fall ; for as its chrysalis is suspended to the extremity of a branch, there might easily be people ignorant enough to imagine that the animal which they saw produced from it, originated from the tree. A distinction, however, must be made between the walking leaf, which is a native only of India, and the mantis, which is likewise found in Europe. In Provence, the peasants call this insect *Prega-Diou*, or the God-prayer ; and, in Latin, it has obtained

ed the name of *mantis religiosa*, from its frequently assuming a singular posture, standing almost upright on its hind legs, which are long, whilst it folds together, and contracts its fore legs, which are shorter. This has some resemblance to that attitude, which the vulgar imagine to be necessary in prayer. In reality, it walks almost solely on its hind legs; and at the same time, uses its fore legs for catching flies and gnats, on which it subsists. This motion of the legs has occasioned weak people to imagine that the mantis pointed out to them the road, by extending its legs, and hence it has been considered as a sacred insect, entitled to regard . . . What! you laugh?

P. But who could avoid it? must we pay our respects to it, and take off our hat?

M. You are very happy in possessing understanding and sense; but you must not laugh at good people, poor or rich, who want these qualities.

P. And are there some rich people then, who believe such things as these?—(One of the rest), yes! money, Dear Sir, does not confer understanding?

M. Not strictly; it is obvious, however, that the rich have better opportunities of instruction than the poor, if instruction were always to be purchased. But, what is still worse, there are some good people who believe that the mantis does not die, till after it has struck its nails in the earth, when its period is arrived, and that these same nails afterwards take root, and produce a verdant plant, which would apparently re-produce other mantises in its leaves, as we observed before. There is a subject for laughter!

THE

THE FROTH-FLY.

THIS is at first, a species of worm, about the thickness of a fly, of a blackish brown, having six feet, a trunk for sucking with, and after the fourth moult, wings. No sooner has it got these, than it flies away, couples, deposits its eggs in the earth, and dies. In spring, the larvæ come forth and swarm on willows, where they are found in the months of May and June. They extract from the leaves, a great quantity of juice, which they afterwards throw out, in the form of a thick white froth, or spittle; one sees it dropping on the ground, as if the tree was loaded with it. Here and there upon the leaves of the willows, one observes masses of this froth, and the insect always contained within it. The vulgar give to this froth, the name of cuckoo's spittle, in the belief that it comes from this bird; but though it frequents willows at this season, it is not for the purpose of depositing this froth, but in quest of the insects it contains, of which it is very fond. This froth is commonly called spring-froth; and after the metamorphosed larva has acquired wings, it is called the grasshopper, or rather cicada-flea, and it is, as well as the insect which follows, a pro-cicada: it has got this name on account of the resemblance which its trunk has to that of the cicada, which is a species of fly, larger than a may-bug, and of course, the largest of this country. But let us observe, on this occasion, that you must not fall into the common error of confounding the cicada with the grasshopper: there

there is not the least resemblance between the two insects, though both sing; and in particular, the cicada does not leap, but has six legs of equal length. Thus, it is not the grasshopper, but the cicada, which the singular insect we are now to speak of, resembles, namely:

THE LANTHERN-CARRIER.

* THIS is thought to be the same insect that in India is called *acoudia*, and in America *conjoin* and *cocoyou*, for it is only found in these remote warm countries. It gets the name of lantern-carrier with us, because its head emits a very clear strong light, during the night, of which the Indians make use as a light, in travelling in the night time, and likewise in their houses. In walking, they fix one of these flies to every foot, another to the arm, sometimes also one on the head, and thus perform a journey of several leagues in the dark. This light is said to proceed from a bag which the *acoudia* has on its head, and which is sometimes larger than a small nut, so that it has been looked upon as a lantern.

We have likewise a small species of beetle, named the glow-worm, and which also gives out a light, during the night, but too feeble to be of much use*.

BLATTAE

* The light produced by these glow-worms, has never been sufficiently explained by philosophers; and we are of opinion, that the subject might furnish important observations, which might perhaps help to explain the nature of light hitherto so little understood.

BLATTAE OR KAKERLACS.

THE second of these names is known in the American isles, and both of them signify a tribe of insects, of which there are several classes. They all shun the light; but such as inhabit this country are much smaller than those in America; where they are as large as a may-bug, and even larger; sometimes brown, sometimes reddish, sometimes whitish, and furnished with antennæ, that are very long and delicate.

These insects are remarkable for their voracity: they thrust themselves into every place, and gnaw every thing; meat, provisions, stuffs, linen, leather, paper; nothing is spared. The larva is fond of meal; nevertheless it eats only the crumbs of bread; in the country they likewise eat the roots of plants.

III. CLASS OF INSECTS.

BUTTERFLIES.

THE third class of insects, is that of butterflies, characterized in general, by a body covered with hair, four broad wings covered with a kind of powder, three pair of legs, a trunk rolled up in a spiral form, two long antennæ, and two large eyes which are formed of several thousands of smaller ones joined together. Their existence is limited to the laying of eggs, and

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then

then dying. I hope, my young friends, we are now in a known country ; for I know you are curious in butterflies.

P. Oh yes, Dear Sir, we have seen many of them. How pretty it is to see them come out of the shell ; then to see them lay their eggs ; and next to observe the hatching of these eggs, and see the young caterpillars come forth ; which immediately begin to eat grass and cabbage leaves !

M. Have not you likewise seen how the caterpillars form their shell, and become chrysalids, before they become butterflies ?

P. Ah, that too is pretty ! and then how they change their skin three or four times before they shut themselves up.

M. Well then ! you have all the curious history of butterflies ; for that which you have mentioned, is the whole. But have you observed how long time is necessary before they become pretty animals with wings ?

P. Yes ; but some take longer time than others ; some take only a few weeks ; others some months.

M. There are some still worse ; for some of them remain more than a whole year shut up in their shells ; so that after having passed two winters and one summer, they make their appearance only the second year. There are likewise a great number of species of butterflies, small and large ; what colours have you not observed them of ?

P. I do not think one could number them. They are so many ! white, yellow, black, blue, red, and then spotted after every possible manner.

M.

M. Yes; it is a great pity that we can scarcely even see the greater number of them, because they fly only during the night.

P. Is it possible?

M. Have you not observed that the greater number of butterflies come forth only in the evening and during the night?

P. We have often seen them fly at night, as the butterfly of the silk-worm; but we thought, they flew likewise in the day time.

M. No, gentlemen; the whole family of butterflies have been divided into two general classes, day-butterflies, and night-butterflies, which are also called phalænæ or moths. There is even a third class, that of the twilight-butterflies or such as appear only in the evening, called also sphynxes. You will find all the three classes in Plate XII. where fig. 13, 16, are a day-butterfly with eggs and shell; a night butterfly, its eggs and shell are represented in fig. 19, 22; lastly, the sphynx or twilight butterfly, with its eggs and caterpillars are seen in fig. 23, 25.

The caterpillars of these three species have all twelve eyes, eight pairs of legs, and feed on grass and leaves; but there are great differences found among them in their shape, manner of living, and metamorphosis.

The caterpillars of the day-butterfly, are partly armed with prickles, partly smooth, and partly covered with down. The first have the head in shape of a heart; change their skin four times; and suspend themselves in some covered situation, before undergoing their metamorphoses: they do not spin silk, but hang perpendicularly with the head undermost from some branch of a tree, or, in some other secure place. Their

chrysalids are rough, and all gilded or spotted with points of gold and silver; they are called caterpillars with bristles, or prickly caterpillars.

Those that are smooth and those which are covered with hair, have a round head, change their skin four times, and on the approach of their metamorphosis, do not seek long for a commodious retreat, but suspend themselves to a wall, a post, a branch, a leaf, in a word, to whatever is nearest, where they cover a small space with their silk, and suspend themselves by the same means. Their chrysalids, or nymphs are likewise rough, but not gilded, nor spotted, and besides, they are fixed by the neck with a thread.

When at last these caterpillars are prepared by a thousand industrious arrangements for the grand alteration they are about to undergo, they remain suspended or laid in the same place, without motion, till they change into butterflies, and can fly; but they never conceal themselves in the earth. Some continue through the whole summer, and others subsist only during certain months; they eat only in the day, and repose during the night. Their butterflies also fly only during the day, and when at rest, they keep their four wings joined and erected on the back. Some of them, lay eggs that are round and green; some of them conical and yellow eggs; and always on the inferior part of the leaf to which they are attached.

Different species of caterpillars derive their names, sometimes from their shape; as the caterpillar with ears, that with tufts, that with a brush, the prickly caterpillar, the hedge-hog, &c. sometimes from their operations, as the miner of vine-leaves, the surveyor, the mason, &c. sometimes from the trees or plants, to which they are attached in preference, as the

caterpillar

caterpillar of the pine, that of the willow, that of the milk-thistle, that of the cabbage; that of the oak, that of fennel, that of hedges; that of grain, &c. Sometimes the name is derived from their colours, as the annular or livery. Lastly, such as live together in society, are named processionaries, and likewise evolutionaries; because they observe a regular order in their march, like a body of troops which performs evolutions under the orders of a commander. There is one species which is very destructive to fruit-trees, on which the butterfly never fails to deposit her eggs; so that the caterpillars which are produced, take sometimes but a single day to plunder a whole tree. The butterfly is of the diurnal class. The caterpillar-bear, or hedge-hog, produces a nocturnal butterfly or phalæna. That of the vine produces a twilight butterfly or sphynx. The cabbage caterpillar produces also a diurnal butterfly of a yellowish grey, which deposits eggs at the lower part of the cabbage-leaves, from which other caterpillars are produced of a grass-green streaked with yellow. These are the insects which pierce the cabbage-leaves like a sieve, as we sometimes observe. Among these caterpillars, there is one which deserves particular notice, the silk-caterpillar, or as we call it, the silk-worm, which produces a nocturnal butterfly.

Among the butterflies, that is, among the day species, to which this name more properly belongs, the following are the most remarkable. The tail-bearer, or swallow-tail, which deposits its eggs on fennel or carrot leaves; the thistle butterfly, which deposits her eggs on thistles, and especially on the holy thistle and burdock; the

nettle-butterfly, which makes choice of that stinging plant for her offspring; the corn butterfly which places hers on that plant which is destined for the use of man, to whom it costs so many labours: the dead-leaf-butterfly, which resembles a parcel of dried leaves upon trees.

You will find also upon nettles, the eggs of those which likewise frequent the hop-tree, and the gooseberry-tree, &c.; on the cabbage, the butterfly with sails, which likewise frequents the apple-tree, the plumb-tree, the aurora-butterfly, &c.; the lily-butterfly, on all kinds of fruit-trees; the pearl-butterfly, on violets, &c.

Thus you have only to consider what species you are fondest of, and then to seek the plant they frequent, to take its caterpillar, carry it off, nourish it with the same plant, and wait till its transformation. If this cost some trouble, we have in return beautiful butterflies, not spoiled like those which we take alive, whose wings are always more or less injured, in whatever way we catch them.

The twilight butterflies, called sphynxes, fly only about at evening, and for the most part have a slow heavy flight. Almost all their caterpillars are very beautiful, carry on their tail, a point or a kind of horn, haunt gardens, woods, fields, where they gnaw trees and plants, and are changed into nymphs without a shell, under the earth. The most remarkable, are the phoenix, whose caterpillar lives on the vine, the large sphynx of vines, whose caterpillars subsist also on the leaves of vines and balsams; that of the rose-laurel, which is produced on this shrub; the death's-head, the largest of all, and the most remarkable, whose caterpillar, the largest too, that we have, is found upon the

. jessamin,

jessamine, on the stalks of earth-apples, on madder, &c.

The phalænæ, or night butterflies, commonly fly only in the dark, and heavily like the sphynx; they are the most numerous: there is an innumerable quantity of them, whose caterpillars are partly covered with hair, partly without it; all of them creep slowly, and live on grass, thistles, nettles, leather, wood, &c. On the approach of their transformation, the greater part of them retire under ground; some conceal themselves in the first obscure corner they can find, and there fabricate for themselves a covering of silk, or a kind of silk, in which they pass their nymph state, and enter into that of butterflies. Such as retire under ground, rest satisfied with this kind of interment, whilst others also seek out some secure retreat among the foliage, to undergo this metamorphosis. Every species of caterpillars fabricates a cod or shell, after a different manner; some make a large covering of silk, of a loose texture, others make a small shell with close meshes, and occupy the middle of it; such as the common caterpillars with brown hairs, and the garden caterpillars with a spotted head, that are so destructive: others fabricate a close texture, like paper, for instance, the annular caterpillars. There are several who construct their covering with so much industry, of grass, wood, bark, or even of their own hairs, that their tombs are at once sufficiently compact, and remarkably beautiful; such are the green caterpillars streaked with yellow of fruit-trees, the hedgehogs, masons, &c.

P. But how is one to distinguish night butterflies

terflies from day butterflies, and from others also, and likewise their caterpillars?

M. On examining them, we observe very considerable differences, beside what take place in their time of flying.

The caterpillars of the phalænæ are seen in the fields only during night, and they remain at rest in their retreats in the day. There are, however, exceptions; for instance, the silk-worm, which crawls on the mulberry-tree, and gnaws the leaves, both in the night and day; in the same manner as we sometimes observe caterpillars of the day, gnawing and eating during the night. As to their structure, those of the night have many of them, a kind of a horn or projection from the posterior part of their body. Those of the sphynx are commonly observed only in the dusk of the evening, or what is called the twilight.

But the butterflies themselves are easier distinguished, for the antennæ are different in those of the night, and in those of the day. In these last they are terminated either by a button or a club, or like a ram's horn; in the phalænæ, on the contrary, they are either prismatical, or with conical threads, or else with a tuft of feathers. Further, as the night butterflies are only destined for a short existence, most of them want a trunk, for sucking with; they live but a few minutes, which must therefore be employed in the re-production of their species, that is, in coupling and laying eggs.

The most remarkable among these last, are the peacock, whose caterpillars live on willow-trees, bullaces, fruit-trees; the forked-tail, which is found on the oak, on the willow, on the poplar; the oak-leaf, upon fruit-trees, and among
the

the grass; the butterfly of the hedge-hog caterpillar, which runs very fast, both on leaves, and in the grass; the butterfly of the silk-worm, on the mulberry-tree; the grain-caterpillar, among fields of grain. Some of the caterpillars of the phalænæ, attach themselves in such a manner to leaves, either for the purpose of nourishment, or for laying their eggs, that they have got the name of roll-leaves; another is called surveyor with a staff, because it is fixed to a branch solely by one extremity of the body, and erects all the rest as stiff and straight as a piece of wood; some others are no less curious. They are found, as we observed, on thistles, nettles, milk-thistle, asparagus, sorrel, fennel, in a word, upon a multitude of plants, trees, and shrubs, in the fields, gardens, orchards, forests; where peasants, wood-foresters, besom-makers, may collect as many as they chuse.

P. Oh! we will give them directions to bring us some of all kinds.

M. Very right; but do not neglect to desire them, at the same time, to bring what may be necessary for nourishing the different species. For, as you have already seen, all caterpillars do not live on the same thing; some eat only cabbages, others, leaves of trees, others, some particular herb; and each of them would rather die of hunger, than eat any other thing. The butterflies well know this, and do not fail to place their eggs in a situation, where they are sure their brood will find subsistence, without being obliged to go in quest of it.

And, in reality, what would become, for instance, of caterpillars which live solely on nettles, if the mother or female butterfly had placed her eggs on the top of a tree? and such as subsist

on the foliage of trees, how could they live, if brought forth on the surface of the earth, and obliged to make a perilous voyage, to find out a tree which suited them to clamber up on? But though these insects be objects of our contempt, though we count their existence nothing, and even less, still divine Providence has condescended to take great care of them, and has not abandoned them to chance. The Creator, after having provided for each a suitable provision, and in abundance, has ordered each butterfly to deposit her eggs in such a situation, as that the hatch might find a table ready covered for them. Each obeys the order with the utmost exactness, and as if it knew that its own caterpillars must have cabbage, nettles, fennel, or any other thing, whilst itself eats neither leaves nor roots, but supports its subtle life, its short and brilliant existence, on the pure nectar of flowers. Each must have been endowed by the Author of its being with this maternal instinct; and it is truly curious to observe a butterfly, for instance, after fluttering about on different flowers in gardens, halt on a cabbage, for the purpose of depositing an egg, return to the flowers, then come again to the cabbage, and continue these alterations till her laying be completed.

P. But our gardener destroys all the caterpillars he meets with; what a pity!

M. You would be better pleased, no doubt, if he would suffer them all to become butterflies, to divert you, would not ye? But to enjoy this pleasure, would you be contented to give up pears, apples, fruits, even bread, roots, and garden stuffs? for we may safely say there is not a single species of plant which has not one or more species of insects to destroy it;

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and caterpillars multiply so astonishingly, that if spared, they would leave us nothing to eat. Thus, since birds do not destroy them all, we must destroy them ourselves. We shall always have butterflies enough remaining, in which we may admire the magnificence of the Creator, even in his smallest works; and so much the more too, as he has lavished wonders to adorn an insect destined to perish for the nourishment of other animals, as birds, or to leave to man his own subsistence. Thus a wealthy man throws away gold, whilst the poor picks up with care the rags off a street.

P. But are caterpillars and butterflies of no other use to us than that?

M. Have you forgot the caterpillar which makes the cods of silk, and the phalæna or night butterfly which produces it? it is not the only caterpillar which makes silk, but it makes the finest; and it is probable, that some might be obtained from several other caterpillars; which possibly might not equal the former in quality, but yet might be sufficient to defray the expences attending the difficult cultivation of the white mulberry-tree.

P. Oh, Dear Sir, it is long since you promised us silk-worms; now is the time.

M. Well! to begin, let us see how they must be managed, before we take the charge of keeping them.

THE SILK-WORM.

THE butterfly of this caterpillar, is a species of phalæna or night butterfly, which deposits its

its eggs, either on the mulberry-tree in those countries that are warm enough for them to be left at liberty, or on small pieces of stuff, or paper, in shelves, when they are reared in a chamber.

Fig. 19. Plate III. represents a mulberry-tree? in fig. 13. you see a small caterpillar of the butterfly; and in fig. 11. one still larger with its trunk; fig. 14. is a female laying eggs, (fig. 15.) These eggs are round and flat, with a small dimple in the middle, of a yellow colour at first, afterwards brown, and lastly, grey.

These eggs give birth to brown caterpillars, which have a black head, nine rings, sixteen feet, nine holes on each side, and a projection at the extremity; but they do not remain long in this state, for at every moulting, they change colour, till at last they became of a pale yellow. At fig. 16. you see three small caterpillars coming out of their eggs.

These caterpillars, like all others, are properly speaking, only butterflies covered with several skins, which they must cast successively. The first falls off shortly after the birth of the caterpillar, and four other moultings take place afterwards, with an interval of about seven days between each.

At each moult, the caterpillar appears as it were sick, and remains some hours, frequently more than a day, without eating, or making the smallest movement.

But in the intervals between moultings, it lives on the leaves of the white mulberry-tree; and this nourishment makes it grow so fast, that its skin becomes too strait, so that it separates and falls off.

Ten

Ten or thirteen days after the fourth moulting, when the caterpillars have eaten enough, and when they have happily arrived at the end of their career, which is forty, or one and forty days, they become yellow at the lower part, discharge all excrementitious matters, and retain only the juice which serves for spinning the silk.

This silky matter occasions some uneasiness to the caterpillar, seemingly from the fullness of the vessels which contain it: it then ceases to eat, and gently moves its head, raised across the branches, till it find a convenient place to attach its first thread to, and to fix itself by; after which, it bends from one side to another, and throws its head round about, till the cod be finished.

During all these motions, a double thread constantly comes from its mouth, and the kind of fabrication which is formed of it, is called cod or coque (Plate III. fig. 17.)

It is within this cod that the caterpillar, at the end of some days, deposits its last skin, to which its sixteen feet remain attached. It then becomes a nymph (Plate III. fig. 18); and after three weeks have expired, it comes forth a winged animal, which, after it has pierced its silky prison, takes wing and flies away: this is the butterfly.

This butterfly is of the number of phalænæ with pectinated antennæ, which have no evident trunk, and which do not eat. It is no longer a being destined for the gross pleasure of eating and digesting, not even for sucking nectar from the flowers; the caterpillar is thought to have supplied these wants for it. The butterfly lives no longer than to find out a mate and couple; which

which continues three or four days, after which the laying takes place, and the insect dies.

The female lays two or three hundred eggs (according to *Valmont de Bomare*, from four to five hundred), which serve for the production of fresh caterpillars, or, as we say, silk worms; and the same history begins again.

P. Oh Dear Sir ! When shall we get silk worms, or caterpillars ?

M. But that is not enough to have the insect merely ; we must have something for it to live on ; have we white mulberry-trees, or at least the leaves ?

P. But can it absolutely eat nothing else ?

M. It does it only with regret, when reduced to the necessity ; besides, it does not thrive, it becomes sick, and sometimes dies, and particularly the silk is good for nothing, or else it does not afford any. Thus, though one may make it eat leaves of sallet, for instance, you see that nothing is to be gained by this change ; so that we must either give up the rearing of silk-worms, or else nourish them according to their taste, either by keeping mulberry-trees of our own, or by purchasing the leaves.

P. Ah, Dear Sir ! are they to be sold ? We must buy some.

M. In good time ; but do you think we know every thing relating to the silk-worm ? and how shall we arrange them in their apartment ? for we are not in a country where we can have the pleasure of seeing them born, grow, eat, labour, lay their eggs, and die upon their favourite tree. Let us therefore, for a little, resume the history of our caterpillars, that fabricate silk.

The silk-worm makes at first a loose and open texture which is called flock-silk, to which
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are added cods that have been pierced, in order to obtain what is called coarse silk, and afterwards when prepared, blurt silk. It next fabricates a fine close web, which serves as a silken house to it, all formed of delicate threads that may be separated. Lastly, the caterpillar forms, within, a covering, which resembles a piece of parchment or a small bladder; in which it remains at rest four or five days, till it changes into a chrysalis; at which period it covers itself still farther with a thin brownish pellicle.

Silk is obtained from all these textures, except from the last covering. The cod is round, of an oval shape or a little lengthened, and nearly the size of a walnut; the silk is commonly of a pale yellow, and the beautiful colours we observe it of, are given it by the dyers.

To unravel the silk cods, they are thrown into warm water to dissolve the glue, and then threads of eight hundred feet in length, or a thousand and more, are separated.

P. Oh mercy! into warm water! but the little animals that are inclosed in the cods, can they endure this heat?

M. No, undoubtedly; it is also done with a design of killing them; and when it is not wished to separate the silk immediately, the chrysalids are destroyed, by exposure to the heat of a strong sun, or to that of an oven.

P. But it is very cruel to destroy all these pretty little animals? could not we wait till the butterflies come forth?

M. Oh certainly, without doubt; at least such people as do not care for having silk to unravel; for the cods which are pierced do not furnish any, because most of the threads are cut. Thus, in order to get butterflies,

a certain number only of the coques or shells are preserved, which are sacrificed for the eggs. Nevertheless they are not rendered altogether useless, by that operation; they are spun like flax, and a kind of coarse silk, as we have already observed, is obtained from them.

Some use is even made of the inner coat, and wad is made of it; it is sometimes kept whole, and sent to the dyer, and is afterwards used for making artificial flowers, which are very pretty, and make good imitations. Thus then, it is at the loss of some hundreds of coques of beautiful silk, that eggs are procured for the ensuing season.

P. It must be very pretty, to see all these eggs hatched on the shelves and bits of stuff, on which they were deposited, and the caterpillars running about through the chamber?

M. Not at all; when they find no food, they do not stir from the place; and their mulberry leaves are given to them in the same place where they were hatched.

P. But do the eggs not remain in the same place, on paper or boards, till their exclusion?

M. No, indeed; they are taken from thence, and collected together by thousands into vessels or boxes. They are then put, during winter, into some place that may not be warm enough to hatch them, before the coming out of the leaves of the mulberry-tree.

For as to dried leaves, these caterpillars do not eat them, though attempts have been made with success to get them to eat them, after they have been softened for a minute in warm water. What is still more; the eggs of the silk-worm are sent into distant countries; we get them from the
Levant,

Levant, Spain, Italy, and other places; but these eggs which have come so far, do not succeed so well as those which are laid in the same country.

P. But when is the proper season for hatching them?

M. In the month of May, or thereabout, the eggs are placed in the bottoms of boxes, or laid on sieves; and in the space of twelve or fifteen days, sooner or later, according to the temperature of the chamber, the caterpillars make their appearance.

P. And do they eat immediately?

M. Ah! no doubt, and heartily; they must be carefully supplied with leaves of the mulberry-tree; at first, they must get only the tenderest, but afterwards, in proportion as they acquire strength and size, we may give them even those of the firmest texture.

P. How often must one give them to eat, in the day?

M. Twice, and at each time, care must be taken to remove the old leaves, for they like cleanness; and the chamber where they are kept, must not be subject to much dust, nor near noise. It must also be neither too hot, nor too cold*. If any of these points are neglected, so that they do not get leaves exactly, or if they be of bad quality, or in too small quantity, or if leaves of lettuce or others be substituted in their place, then the silk-worms, spin but little or none, the silk is bad, or else they mostly languish and die.

Flies,

* The proper temperature for rearing silk-worms, has been found to be about 18 degrees of Beaumur's thermometer,

Flies, wasps, spiders must be carefully kept away, for they are very distressing enemies to them.

In Spain, Portugal, Italy, in the East, and other warm countries, there is no occasion for so much attention. In those regions there is little or no winter, the mulberry-trees are almost constantly in leaf, and the caterpillars constantly find food; so that one may see there almost through the whole season, at once, eggs, caterpillars, cods and butterflies. Then the inhabitants clamber up on the trees, and gather what quantity of cods they chuse for silk, leaving only such as are destined for producing eggs for the ensuing season. To produce one pound of silk, from eight to ten pounds of cods are necessary, or two thousand five hundred, or at most, three thousand cods; and as each female lays two or three hundred eggs, it follows, reckoning at two hundred, that fifteen or twenty females, with as many males, are sufficient to produce a pound of silk.

The warm climate of Asia, is the native country of the silk-worm; it was imported into Italy above twelve hundred years ago; from thence it passed into Spain, and afterwards likewise into France; but it is only within these few years that silk-worms have been reared in Germany, and in the northern countries; in some of these countries they succeed well, as in Brandenburg, Austria, Westphalia, Saxony, Hanover, &c.

P. Oh! if all caterpillars spun silk, like these? that, Dear Sir, would not be so difficult, would it?

M. There are many others which likewise spin a silky matter, and with much art; but as yet

yet we have not been able to use it. On the other hand, they produce more beautiful butterflies than that of the silk-worm, but this is a small advantage. As to these, we shall seek them for our amusement, if we cannot find any thing better; we must set about making a collection of butterflies, and we shall collect all the most beautiful species we can find*.

THE BUTTERFLY OF FRUIT-TREES.

THIS is a small phalæna of a bluish colour, marked with black spots, which deposits its eggs in pears and apples; and the worm or caterpillar, which is produced, eats the fruits; you have met with it more than once under your tooth, when eating a pear or an apple; and I question if it gave you much pleasure.

The caterpillars of plumbs, come likewise from certain small nocturnal butterflies. Another of these insects deposits eggs on furs, (Plate X. fig. 30.) on cloths that are seldom used, and larvæ or caterpillars are produced from them; (Plate X. fig. 31.) which amuse us, on bringing the clothes to light for the purpose of decorating ourselves, with their strange carved work.

* Children may be shown the excellent work of Ræsel on insects.

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THE INSECT-BUTTERFLY.

THIS like the preceding is a phalæna, which seeks insects and dead animals that are stuffed, for the purpose of depositing its eggs, from which are produced caterpillars which destroy or spoil the finest collections; it is seen in the evenings and at night roaming about apartments, in quest of a place for depositing its eggs, upon articles where one would not wish so destructive a family established. Fig. 28 of Plate X represents a butterfly of this species, and fig. 29, its larva.

THE WHITE BUTTERFLY OF GRAIN.

THIS phalæna variegated with spots, black, brown and red, deposits its eggs in granaries of wheat, rye, pease, barley, beans, oats, &c. The caterpillar which is produced from it, begins with piercing the grain of which it destroys the farinaceous matter; it next lays up a store of three, four or even of eight grains which it surrounds with a thin web. At last having attained its full size, it retires between the chinks of some board, where it changes into a chrysalis, and then into a butterfly. A single granary often contains thousands of them.

There is another insect still more destructive to grain, produced by certain small beetles with a trunk. The only way to banish these, is by often turning heaps of grain, and by frequently washing

washing the floors and rafters with brine, or giving them a coat of pitch.

IV. CLASS OF INSECTS.

Now then we come to the fourth class of our little animals, in which we find *Libellulæ*, or Dragon-flies, *Ephemeræ*, or day flies, *Hemerobii*, *Phyryganeæ*, *Myrmeleon* or lion-ant.

LIBELLULÆ, OR DRAGON-FLIES.

How often have you seen these pretty winged insects flying on the waters, or round about you? you did not then suspect that these inhabitants of the air, had begun their career by living for a long while in the waters. Yet nothing is truer; their larvæ have no other place of residence, and they subsist on other small aquatick insects like themselves. Sometimes, these insects prey upon one another.

When they have attained their full size, they leave the water and take to the bank, where they attach themselves to some plant, the stalk of some herb, or any dry matter; there they remain at rest, without changing into nymphs, till their bodies split asunder, and give vent to a winged insect which takes wing, and flies off. (see Plate VIII, fig. 12.)

Dragon-flies, which in different countries are called, sometimes aquatick nymphs, sometimes ladies, devil's horses, or devil's needles, sometimes spinsters, have four naked wings of the shape
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of a fillet, two large transparent eyes which compose the greater part of the head, and a very long shaped body, formed of ten rings, which is terminated by two or three small forks. Their neck is not thicker than a pin, and can be turned at pleasure.

They fly very fast, and frequently halt on ears of corn, not to eat them, but only to rest themselves, and to discover their food, which consists of small insects that hover in the air.

P. Dear Sir, how shall we do to catch some of them? It is in vain for me to run after them, I am never able to come up with them.

M. They fly better than you run, I cannot help that. Well! wait till they halt; watch them some night or morning, or else during rain, perhaps you may more be successful.

They are not all of the same size, nor of the same colour. Some are as long as my finger, others are scarcely so long as yours. Some are of a dark brown, marked over the whole body with spots of a beautiful blue and green: others, on a green or red ground or a light brown, have spots and streaks black, blue and yellow; others in short are almost wholly yellow, grey or blue, and mostly all of them have the lower part of the body terminated by a small fork with two or three points.

They deposit their eggs in water, and to keep themselves dry, they rest on a small bit of floating wood, on a stone, or the stalk of a bulrush, whence they let their eggs drop into the water. In a few days after, the larvæ make their appearance.* One peculiarity of these nymphs,

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* According to Bomare, these larvæ are originally small hexapodal worms, or worms with six feet, which become really

is, that they have all a kind of mask before their mouth, which they can move at pleasure, and which enables them to catch the little insects, on which they subsist. These nymphs live ten or eleven months in water before the period of their metamorphosis arrives.

EPHEMERÆ OR DAY-FLIES.

THESE have an origin similar to that of dragon-flies, are furnished with an equal number of wings, and lay their eggs in the same manner, but are smaller, and of rather different colours; for they are almost wholly grey. They have besides two or three long threads at the extremity of the abdomen, and do not eat. (Plate VIII. fig. 33.)

P. How! they do not eat;—and how do they live then?

M. But, tell me, if you had passed the night in eating and drinking, might not you well wait till the evening or night following, without returning to table, especially if it were the last day of your life?

P. But then, dear Sir, it could not be said, that I had not eaten any thing in my life.

M. True: but if you had become a day fly when you rose from table that last night? then this little insect had eaten nothing.

P. And is it then the last day to the ephemeræ?

M. Exactly: they enjoy but one day the pleasure of flying: you see that it would not be worth while

really nymphs before they attain their full size, and which afterwards live in the state of nymphs, constantly in water, till they leave it to become winged animals.

while to spend it in eating, when they can employ it to better purpose. That is the meaning of the name *ephemeræ*. Besides you have already seen that the greater part of nocturnal butterflies or *phalænæ*, though they live longer, do not eat any more than these. Fishers call them the manna of fishes; because as they fall, down in certain countries in prodigious quantities on the brink of rivers, and are used for baiting hooks; they imagine that it is a manna that comes down from heaven; and rather, because this singular shower continues only for three days successively, each day for one half hour.

PHRYGANEÆ.

THEY are likewise called in some countries spring flies; they very much resemble dragonflies; and fly about with the same animation in gardens that are situated on the edge of ponds, rivers, or any pieces of water, in the spring. They are particularly remarkable for the singular structure of their covers in passing from their larva state; they construct them with pieces of bulrushes or plants, or small shells or little grains of sand, of which they form a cylindrical apartment, in which they swim under the water, and which serves them for a safe retreat from their enemies.

HEME.

HEMEROBIUS.

THUS that insect is called, which from its enmity to plant-lice, on which it subsists, has likewise obtained the name of plant-lice-lion. Its fly resembles almost completely the dragon-fly. Further, its larva, which is at first a worm with six feet, lives on land, or in dry situations.

But we shall now see the most skillful and industrious of hunters.

P. How then? is it an insect belonging to our fourth class?

M. You know, that of five species there still remains one to be mentioned, to wit:

THE MYRMELEON.

Do you see this small hollow in the sand? (Plate XI. fig. 18.) there it is very *apropos*. We shall soon observe in it, a small insect, of which we are now going to speak. The fly which is produced from it, is very like the dragon-fly, but does not fly cleverly; in fact, it flies only at night, it flies heavily, rests frequently, and sometimes enters open chambers, where it perceives light.

P. For the purpose of hunting likewise?

M. No, undoubtedly; besides it is only its larva, which takes its stand for game, which digs circular holes, which watches and preys upon ants. Here, hold; it is not a pretty insect, but it is a good mathematician, and it is destined to become a little bird, that is, a fly, which shall

no longer have this red brown mixed with grey. It is much smaller on its exclusion from the egg: but, as it is an indefatigable hunter, it soon becomes large and fat, till such time as it be in a situation to change into a fly.

P. And how does it go a hunting?

M. You must first know that its mother-fly never fails to deposit the egg whence it is produced, in the sand in the neighbourhood of ants, on which it is to subsist. Thus, as soon as it leaves the egg, it has only to dig its hole and place itself in the bottom, to watch the passage of caterpillars and ants, but especially ants. Ill fated is that stupid insect which comes within the margin of its hole: presently a shower of sand which the myrmeleon throws from the bottom, and which he causes to light on its head, compels it to descend into the claws of the hunter, who sucks out its entrails.

It is provided with a pair of forceps, between which is a sucker, and the extremity of its body terminates in a very hard point. With these sole instruments, it is curious to observe him labour, and backwards too. He begins with tracing out with his hinder part, a circle which gives the dimensions of his hole, and which is as exact as if it had been made with a compass. Having traced out this circle, when he sees all quiet round about him, he begins to work within the circle and to dig.

P. But what does he make of the sand which comes out of the hole?

M. He throws it with his forceps or horns all round the circle, like a ditcher with his spade, and he thus forms a funnel, so that no insect can come within the brim of this hole without tumbling down some grain of sand to the bottom, or even

without

without falling itself with the moving sand, which slides from beneath the light weight of its body. Then the myrmeleon who is concealed at the bottom of the hole, or at the center of the funnel, advertised by the fall of sand, leaps on his prey, seizes it and sucks its entrails; or if it should happen to be an insect that is too strong, and makes its escape, he throws such a shower of sand upon its head, that he at last makes himself master of it.

P. But, do enough of ants always come in his way, though he does not go in quest of them?

M. I told you that he was at once the most dexterous and the most unwearied of hunters. You have seen how he forms a circular cavity and gives a declivity to the sand, so that it cannot be touched without tumbling down, and that a single grain cannot fall but he feels it. In reality, he may sometimes be observed whole days, and even longer, lying on the watch, without stirring or eating, till some prey offers itself at discretion. Nevertheless, as he takes care to place himself in the neighbourhood of ants, he is not frequently subjected to such distressing fasts.

Besides, it is only in the evening, that our hunter seizes his prey; during the day he lies concealed in one of the sides of his hole, and it is particularly in moon-light that one may have the pleasure of seeing his manœuvres, by carrying an ant to him, and throwing it within his hole.

After having sucked out the entrails of one, he takes great care not to leave the skeleton at the bottom of his hole, for fear of frightening others; but he raises it with his forceps, and rows it to the distance of a full half foot from the brink of his hole.

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In walking over sandy soils, we shall find plenty of these funnel-shaped holes, both large and small; for the diameter of each hole, is proportioned to the size of the insect, and in proportion to its growth, it enlarges the hole.

V. CLASS OF INSECTS.

THIS family is not less numerous than the preceding. Where shall we begin? with ants? with bees? with flies? for these are the species it contains, namely, such as have four membranous wings, and are mostly armed with a sting for their defence, at the extremity of their body. These are first bees and hornets, wasps, and ants.

ANTS.

P. But ants have not wings, however; is it not so, Dear Sir?

M. Are you very certain of that?

P. I am very certain of never having seen any winged.

M. Come then, I shall shew you the first.

P. Yes indeed, Dear Sir, I believe you; but it may perhaps be another species of ants.

M. No, no, my young friend, they shall be of the same species that you are acquainted with; and we shall see some of them in every ant-hillock that you can shew me, that is not far off.

P. Ah! but they have not all wings then?

M.

M. That is true, my dear ; you are not mistaken in observing many ants without wings ; they are far from being all winged, for only the males and the females have wings.

P. The males and females only !

M. Well, does that surprise you ?

P. But, dear Sir, are there then other animals than males and females ? You have never told us any thing of such, and we have never seen any of them.

M. Ah ! there you are mistaken ; it is true however that I have not told you any thing about them, because we were not yet come that length : but it is most certain, that you have seen some of them, and even many.

P. And how then ?

M. You acknowledge that you have never seen winged ants. Well ! in that case, all those which you have seen, were neither males nor females.

P. And what were they then ?

M. Labouring ants. For every republic of ants is formed of those three species ; males and females, which after arriving at their full size, get wings ; and the labouring ants, which never get wings, and are neither males nor females, but which are sometimes for this reason called mules. They are these last which labour for the others, and which have the whole charge, as the constructing of a dwelling and taking care of the offspring produced by the males and females.

There are five species of ants, namely the house-ants which are the largest, the large black and the small black ants, and lastly the red and the yellow.

All of them have the head armed with a double saw, or jaw, a mouth, two horns, two eyes, and a neck which is fixed to the breast or corselet.

The jaw is formed of an osseous matter, each side of which occupies one side of the mouth, and with four or five teeth, with a small hook at the extremity.

The mouth is only a hollow canal which in them supplies the place of a gullet, and which is accompanied with four horns that move on hinges, or apophyses, which they use as lips and fingers for carrying their nourishment to their mouth.

Their eyes are immoveable, so that they do not see before them, and are obliged to use their antennæ to run forwards with safety.

They have six feet, of which the two before are shorter than those behind.

They have likewise a sting, except the males, which have none; this sting is hollow, so that when ants sting, they throw out a kind of acrid liquor, which produces an itching and a small tumor, of which the pain, though severe enough at first, is soon over.

These insects form different commonwealths or colonies, which commonly have their residence near one another. But they do not visit one another, and if an ant hazards a visit to a neighbouring commonwealth, she is immediately expelled, or even killed and eaten without mercy.

Each time that ants of different companies meet, a battle takes place, where some remain dead on the field. If the two troops be in force, they then arrange themselves in good order, and the action becomes

becomes warm: they fall by hundreds. After which the conqueror forthwith makes himself master of the enemy's camp, where he places sentinels to watch such as fly.

If the patroles meet with an enemy, he is slain upon the spot; but if it be some comrade that has lost his way during the engagement, or or that has escaped from prison, they take him, and bring him to his abode.

P. But what becomes of the ants during winter, when the ground is frozen? they do not die, do they, Dear Sir?

M. Many of them die, but not all (according to *Bomare*, only the males and a great part of the females, but not the labourers.) They dig their habitations to the depth of five or six feet in the earth, and there remain torpid till spring. But, in warm climates they are not not subject to this lethargy; they there labour constantly and eat likewise without sleeping.

Their abode is divided into a great number of small apartments, which communicate together by means of small galleries, which are like small subterraneous canals; these apartments or cells are of an oval figure, but absolutely without glue, or bird-lime; and yet they suffer but little inconvenience from the rain.

They begin by cutting the earth into small pieces, which they afterwards carry away with the nails with which their legs are furnished. They keep their abode in great neatness, and as soon as any of them dies, the carcase is carried away and left at a good distance.

It was thought formerly, that these insects formed a kind of republic or state, all composed of males and females, as you imagined too

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at first. But it has been discovered, that the greater number, as among bees and wasps, are neither one nor other, and that the bulk of the state is formed solely of working ants, destined to take care of the young, produced from the eggs that are laid by the queen. In the space of seven or eight months, she lays from seven to eight thousand.

The female ants are longer and thicker than the males, and the labourers are distinguished, not only because they are rather the most numerous, and want wings, but also because they are the smallest of all, so that the males are even twice as large*.

Every compleat colony, has at least one queen, who is distinguished from the vulgar, by her size and colour. She is five times as large as the others; and, beside the two immoveable eyes which these possess, she has three other smaller ones disposed in a triangle on the fore-part of her head, which enable her to run through, with ease, all the dark nooks and corners of her subterraneous palace, for the purpose of depositing her eggs in the different cells. As soon as she makes her appearance within a cell, she is received with the most flattering attention, her subjects shew the most lively joy, and are eager to afford her every possible service. But, that continues no longer than she has eggs to lay; as soon as she has performed this function, she
loses

* The whole history of this Queen of the ants, will be so much the newer, as Bomare has not a word of it, and allows as great a number of females that lay eggs, as of males. Another difference is, that he makes the labourers, not the smallest, but of a medium size between the females, which are the largest of the colony, and the males which are the smallest. To ascertain these facts, will afford young people an interesting amusement.

loses much of that respect. The case is not the same with a swarm of bees, they cannot live without their queen, they are always attached to her, and never quit the place where she is.

The most numerous of the ants are the yellow, whose queen deposits some eggs in each cell, from the month of January till that of September; and in all, about eight thousand of each species, males, females, and labourers. She lays the two former species in spring, and the others in July and in August; these last are white and transparent, whilst those of the females are black, and those of the males, brown. Thus, young ants are produced from eggs that were laid by the old, the preceding year.

The ant-mules, or the workers, hatch the eggs for some days, and then they become quite white; by and by they become rough, and covered with short hairs; at last they take the form of worms which cannot yet move from their places. But as soon as they have attained their full size, the workers carry them to the surface of the hillock, and cease to carry them provisions any longer.

P. But can they live in that way without food?

M. Like other insects which change into chrysalids: for this is what they do; these worms or caterpillars, begin to spin, and form a kind of silky texture, in which they remain shut up. These are the large white parcels, that are commonly taken for the eggs of ants.

P. How! these are not eggs then?

M. But you must have observed, that they were larger than the ants, themselves: now it is uncommon for the egg to be larger than the animal.

mal which lays it, and no less unnatural: for how could an ant lay several thousand of eggs larger than herself? The eggs of an ant are extremely small, and can with difficulty be perceived.

P. And how long do they continue in their pupa state?

M. That is according to their species, the females continue six weeks in chrysalids, but the males, and the labourers or mules, only four weeks. But have not you often been surprised to see how much care the ants take of their pupæ?

P. Oh! undoubtedly! for on stirring or overturning any ant-hillock, we have always observed the ants busied in carrying their eggs, as we called them, without minding any other thing; and were surprised at their carrying them with so much ease, though they were very large. They must be very light; are not they, dear Sir?

M. Or the ants strong and active, as in reality they are. But that is but a small part of the care they take of their nymphs: if you observe, you will find that in the morning, they carry them all out in the rays of the sun; and, on the approach of evening, they remove them within the hillock. On overturning their abodes, one is surprised at the dispatch with which they secure their eggs, their worms, and their nymphs: in less than half an hour, none of these are any longer to be seen: all is hid under the ground.

P. And why do they place their nymphs in the sun?

M. It is to hatch them the sooner. The females come forth first (their eggs having been first laid); they appear in the shape of large flies, which immediately fly away. Soon after, the
males

males make their appearance, like small flies, which also take wing; and the others do not come forth till afterwards, have no wings, but, instead of moving through the air, are obliged to remain on the spot, and there to labour in constructing their future habitations.

P. But is it true which is told in the fable of the grasshopper and the ant, that the ant lays up provisions for winter?

M. The fable is, in this respect, true; and it is very certain that they collect during autumn all sorts of small grains, and even small pieces of gum, which they take care to preserve in such a manner under ground, that the provisions neither become damp nor spoil.

P. But of what use, dear Sir, are they to them, if they sleep during winter?

M. It is likewise true, that they pass the whole of the cold season in a kind of lethargy or torpid state, and of course do not eat during that period. But they likewise waken from this long sleep before the plants begin to vegetate; and, of course, before they can find any fresh food, at least with ease; for the first zephyrs of spring bring back all their activity, and their appetite must be keen in proportion to the long fast which they have had during sleep; and yet these first genial breezes of spring do not all at once produce nourishment for the ants. Thus you see that their foresight is so much the more admirable, as it respects a want that is farther removed than you imagined. It is not without reason, then, that this industrious and provident insect is proposed as a pattern to men that are idle and imprudent.*

K 6

P. But

* Observe how naturalists differ from one another. Bon-mare

P. But do ants likewise do hurt?

M. Hurt! not strictly; they must live, and do not incommode themselves if the pears, the apples, the cherries, the apricots, which they nibble, have been reserved by our avidity for our palace minions and epicures; nor if the buds and flowers be spoiled by their frequent courses. Nevertheless, the hurt is not considerable except in meadows, where their hillocks are very destructive to the grass.

P. But are they not likewise of some use?

M. Yes indeed: they serve for food to several other animals, even to some that are pretty large; they are likewise of some use to us without intending it; for we rob them of the gum or resin, which they collect on cherry-trees, and plumb-trees, and make use of it under the name of incense of *Thuringia*, because a great part of it is brought from that part of Germany, and other quarters, where it is called wild incense, or incense of the woods. Besides, ants destroy a great many caterpillars, in the fields, in gardens, and in granaries: and their pupæ or nymphs furnish birds, especially nightingales, a morsel they are very fond of. They are also very dexterous in dissecting rats, frogs, and toads, when they find them; and this is an article for amateurs, who are curious of these kinds of skeletons.

There are many other species of ants, especially foreign, and in America; there are some countries where they do infinite damage, even to such a degree as to devour, in a few days, whole
ware-houses

mare asserts positively that we are wrong in supposing, they make provision for winter, as they pass into a torpid state, and in reality make no such provision. So that we may learn industry of them, but they afford no example of foresight.

ware-houses of sugar, and even distress men. But, the most singular of these species, are the visiting ants, who go in an armed body, with a front guard, and a rear guard, visit gentlemen's seats, and country houses, where they destroy all insects, and even rats, so that they are received with pleasure, and all the doors and all the cabinets are opened to them, and people are even sorry when they are a long while in coming. But there are likewise in America, animals which make great havock among ants, which are called in that country *tamandua*; there are several species of them, one of which has a very long muzzle, and a slender tongue, above two feet in length.* (See Plate II. fig. 17. and 20.)

BEES.

THIS species of insects is much more useful to us than ants, since, from a single hive, one year with another, three or four pounds of wax, with twenty, thirty, or forty pounds of honey, are obtained. Thus, whilst we destroy ants, we rear bees with great care.

P. But

* An excellent method for making ants quit a spot of ground, is, to bury in an ant-hillock, some fish bowels; and to frighten them from a tree, one has only to surround the trunk, with a cord steeped in some fish-water; they leave the place immediately. They may also be expelled, without return, from a garde-manger, or other place, by placing in it a cornet of paper, in which have been put some blades of grass, that had boiled for a quarter of an hour, with some handfuls of the leaves and roots of hemlock. Powdered sulphur, spread on a bit of paper, and laid in a drawer, likewise puts them away.

P. But, forty pounds of honey ! is that possible, dear Sir ?

M. Undoubtedly. But consider a little, how industrious and assiduous, these little animals are in their labours, during the whole summer. They perform not less than four or five journeys daily, and return each time, well loaded with spoil, to the hive.

P. It is true, bees would be charming little animals, if they had not such a treacherous and cruel sting, which disgusts and deters, even their best friends, from approaching them.

M. Ah ! have you felt it sometimes ?

P. Alas ! what can one do but keep away from them ?

M. And would you, then, have these little animals so weak, so delicate, abandoned to the pleasure of their enemies, without the power either of defence or revenge ?

P. But we are not their enemies ; quite otherwise.

M. And what do you want with them, then ?

P. I only wanted to catch one of them. . . .

M. And then to kill it for your amusement ; was it not so ?

P. As to that, No ; but only to discover where they kept their wax and their honey, and then let them fly away.

M. And you imagine, such industrious labourers as bees, have nothing better to do, than to lose time in satisfying your curiosity, and interrupt their labour, for your amusement ?

P. But, how then are we to learn what we wish to know ?

M. All in good time ; but the bee knows every thing that it wishes to know, and gives itself little concern with our whims. And do
you

you think, that if they had sense enough to reflect, that we did them good only like traitors, to rob them of the fruit of their labours, their wax and their honey : can you imagine, that they would in this case consider us as their good friends ?

P. But if one does take away some from them, they have only to make more at their leisure, since we supply them with all

M. That is, if a person came to rob you of all your fine drawings, such as had cost you the most labour, you could have nothing to say, if he furnished you in their stead, with some sheets of paper, and some pencils ? How do you like it ?

P. But we do hurt then to all beasts, since we eat sheep, and birds, and hares.

M. And when a boar destroys a dog or even a man who hunted him, in defence of his life, do you think him very wrong, and that he deserves to perish by the hands of the executioner ? The case is the same with bees ; they have only a small sting instead of a cruel tusk ; if it was not for this they would tear us in the same manner, and with reason. We are the enemies of every thing in nature, that lives, and is of a different species ; and, since the Creator has, in some measure, placed us under this necessity, all that we can do, is not to be cruel and ferocious enemies, who slay and massacre without necessity, or solely for the pleasure of massacring.

P. And who could have the heart

M. Would not you wish to live with those nations of India, who consider it as a crime to take away a life which has been bestowed by the Creator ?

P. Ah !

P. Ah! dear Sir, what amiable people these are; their name?

M. They are the *Banians*, or as we speak, *Banians*; nevertheless, they make no scruple to take milk from the flocks, and honey from the bees, but they do not kill them.

Besides, if the bee avenges itself by darting its sting, that is indeed painful to us, but is still more fatal to itself; for it can only give one, and this very stroke is its own death; its sting remains in the wound, without its being able to withdraw it, and without a sting it cannot live. In spite of that, in their rage they regard nothing, and defend the public at the risk of their lives; as if they understood, that it was glorious to die for one's country. Thus, they have been known to kill men, and even horses, with their stings, when too much irritated, and beaten at random. It is not even safe to approach too near them; they only allow a person who is in the habit of looking after them every day, to take this liberty; he may take them in handfuls, and do what he has a mind with them, without their doing him any injury. It requires no little art to tame these little animals.

Thus, when you want to inform yourself of any thing concerning them, take your precautions well, and be not deterred by a petty injury; for I could guess, that you did not find out, at that time, where the bees keep the wax and the honey.

P. Indeed, dear Sir, that is very true.

M. Well! you will see that they carry the materials of the wax upon their hind-legs, and that they have the honey within their body even; so that, at last, you would have found it necessary to kill the bee, through friendship for her, and to get acquainted with her. . . .

P. But

P. But are there three kinds of bees, as there are of ants?

M. Exactly; there are in every hive, 1st, working bees, or mules, (Plate IV. fig. 15.) which are neither males nor females, and these are the most numerous. 2dly, Males, or false drones. (fig. 14.) which are less numerous, and which are named thus, to distinguish them from the hairy drones, that inhabit the fields. 3dly, Female bees, which are called mothers, or queens, (fig. 13.) and which are more scarce. The workers are the smallest, the males the largest, and the females are of a middle size.

The males are near double the size of the workers, but want stings; besides, they fly heavily, are very indolent, and are easily laid hold of in Autumn.

The females, or queen mothers, have a sting, and are longer than the males or the workers; in other respects, they are exactly like these. Have you seen a hive yet?

P. Not yet, dear Sir; you will do us a pleasure in showing us one.

M. Look, here are two, (Plate IV.) fig. 6. is a shut hive: the bees come in and go out by this small opening which you see there. Fig. 7. is an open one; there one observes hexagonal cells, some of which are filled with honey.

P. But how many bees are there in the whole in a hive?

M. Sometimes more, sometimes fewer; in some ten, fifteen, and twenty thousand; in others, thirty, forty, or even seventy thousand. Over all these, there is but one queen, mother, or female; and the number of males does not exceed two or three hundred, though it sometimes goes the length of a thousand
and

and sixteen hundred. The remainder is composed of working bees.

P. But why are there so many labouring bees in proportion to the others?

M. Because they are obliged to labour for the others, and to support them.

P. And the queens, nor even the males, do they never go abroad in quest of honey or wax?

M. No, assuredly; they never so much as go out of the hive.

P. And, do they stay, then, to guard the house?

M. They couple, and produce eggs, which the queen lays, and the males hatch. Thus, you see, they are not useless members of the state, since they serve to people it, and, of course, to perpetuate, to support, and preserve it.

P. And how many eggs does the queen lay?

M. From thirty to forty thousand.

P. What! all at once?

M. No; she takes for these functions an interval of six, eight, or ten weeks; but each day she lays a certain number; that is, two or three hundred. When she is going to lay, she begins by making a visit to the cell, prepared for these eggs, accompanied by some males, who examine along with her, if every thing be in good order; she then deposits one in each cell, and continues this operation every day, till all the cells be provided, great and small.

P. Are the cells then not all equal?

M. As the bees are of three different sizes, it is natural, that there should be likewise three sizes for the cells, in the same proportion. It is the same in respect of number; for there are only six or ten royal cells, some hundreds for
the

the males, and several thousands for the labourers.

P. And do the labourers construct all these cells !

M. And who else ? It is their first labour ; they begin by stopping up every hole, every chink, with a viscous matter, called propolis ; they next construct the cells, which are all of a hexagonal figure, or with six sides, with the utmost regularity and niceness, but of a different substance, namely wax. It is only after having completed this fabrication, that they begin to lay up a store of honey and wax, in particular cells, prepared for their reception.

It is truly curious to observe them at work in their hives. Some are occupied in stopping up the smallest holes, as well to defend themselves from cold, as to shut out their enemies, or intrusive guests. Others are at labour constructing the cells ; others bring home the materials for the wax ; others wait the arrival of the free-booters at the door, to relieve them of their burdens. by shaking their legs, till the little balls drop from them. These little balls are immediately carried to a magazine destined for that purpose ; and the plundered bees fly away for a new booty. If they find, however, no body at the door to unload them, they carry their provision themselves to the magazine, where they get rid of it, by inserting their two hind-legs within the cell, while they support themselves on the other four, and then by rubbing and shaking these two legs, till the whole fall off. Then others are stationed there, who are employed in kneading this matter with the feet, to spread and flatten it, then in placing the layers,

one

one upon another, till the whole be reduced to wax.

P. Is it not wax already, completely formed?

M. No indeed, it is only the materials for wax, or of which the bees afterwards prepare wax in a particular stomach with which they are furnished, and which is different from that in which they prepare the honey. Thus they must first swallow all these materials for wax, and next they bring it up after a short interval in a kind of pulp: and it is then only that by working it with the tongue, the teeth and the feet, they use it in the construction of their admirable hexagonal cells.

P. Is it the same also in respect of the honey?

M. Just the same. The juices from which it is formed must be elaborated in their turns in another stomach, likewise destined for this purpose, before it becomes honey fit for their purposes.

P. But do they not collect wax and honey in the same journey?

M. Yes indeed, when they can; and they swallow at once the juices for the honey, whilst they fix the materials for the wax to their hind legs, with a dexterity and dispatch, that are astonishing. You have only to observe attentively, whilst they roll and tumble about in the calix of flowers, across the petals, covered with a fragrant dust, which sticks to the hairs, with which their whole body is covered. You will see with what dexterity they collect and fix it in the form of a ball, to their hind legs.

P. But is there honey in all the flowers which bees go to suck?

it

M. It is true, that they suck many, of very different kinds, but they would not stop at them, if there was nothing to be plundered. This same variety of flowers, likewise produces a diversity of taste and colour in the honey. Every month furnishes them with fresh flowers to rob; but it is the flower of the linden-tree, which affords them a food the most to their taste; so that if it set in wet at this season, the bees suffer greatly, and there is a bad crop of honey. In general, bees cannot suffer moisture.

P. But what do these poor little creatures do the whole winter? do they die of cold and hunger, or do they continue also torpid like the ants?

M. Not at all; they continue alive, provided something be left for them to subsist on, and they have not been robbed of all their store. As to cold, they do not even feel it; it is warm enough within their hives; so that, in spring, they are all ready to begin anew their operations. But when they have been plundered of their honey, or a rainy season has prevented the necessary provisions, then there is no alternative, they must die of hunger; nevertheless, people do not grudge to nourish them with other honey than their own or that of the present year, well knowing they will be sufficiently repaid for this expence the year following.

P. Ah! but, dear Sir, it is very remarkable, that in autumn, while so many flowers remain under our feet, one should see them already dead at the entry to their hives?

M. Undoubtedly, if you had observed accurately, these were not the labourers or working bees, but idle males who were no longer good for any thing, but to consume to no purpose, the provision; in this situation they drive them from

from the hive, or even put them to death. It is true, notwithstanding, that these labourers are likewise sometimes found dead: but hear how this matter happens.

In the progress of their multiplication, it happens at last, that a hive becomes too full, and even frequently contains two or three queens or more. It then becomes necessary for the young queens to take their measures, and to leave forever their country, their native soil, for the purpose of establishing a colony in some other quarter, with a certain number of males and several thousands of working bees; for they never allow of more than one queen in a hive; so that there is no medium, they must go or perish. Generally they choose the first, and an emigration takes place; this is what is called a swarm.

Now as the attachment of bees to their queen is so extraordinary, as to make them do every thing to please her, to stop only where she is, to follow her every where, and even to leave off all labour and making booty, if she chance to die or perish by some accident; in a word, as she is in possession of authority, there is no fear of a queen going away without attendants; her retinue is commonly composed of several thousand bees.

P. And where do they then?

M. To the first tree they find or any other place, indifferently. Have you never read that Samson found honey in the mouth of a dead lion, and that honey dropped from the trees in the land of Canaan? Even at present there are still countries where wild bees are found living in swarms upon trees, and depositing their honey there.

P.

P. Ah! what I would give to see it! are there some of them likewise near to us? for certainly the bees which leave hives, to light on trees, do the same. I should like to find one of them.

M. You may spare yourself the trouble of seeking them. We have many species of wild bees, as mason bees, carpenters, humming bees, hornets, with which we shall get a little acquainted by and by: but no honey is gotten from these, and they are not swarms that have left hives; for these we are at great pains to retake, and to furnish them also with a hive of their own.

P. Yes! but there is nothing in this hive; what can they do within it?

M. Never fear; these children are not inferior to their parents. After a few hours you shall see them set off in search of booty, bring back their little balls of wax and their supply of *propolis*, afterwards honey likewise, and lastly build within the empty hive a habitation exactly similar to that in which they were produced.

P. But if they go far in quest of booty, how can they find their new abode, which they have not yet had time minutely to examine.

Oh! no matter for that, it seldom happens that they go astray. It is true however, in that case they run great danger, for if they go to present themselves at a stranger door, a bee commonwealth is not hospitable: they repulse them, they even attack them cruelly, and they kill them; this is the true reason why one sometimes observes the carcasses of working bees in autumn lying before hives.

P. Ah! how shocking that is!

M.

M. It is not pretty; one would be delighted to see the state afford shelter to a poor wanderer and assist him in regaining his home, on condition of a return in a like unfortunate situation. But what is still worse; is a regular massacre, an annual St Bartholomew's day, a sanguinary banquet which the bees are in the habit of celebrating as soon as the season sets in cold, and they can no longer find any booty in the fields.

P. What, do they fight with one another?

M. No it is not a battle, since those which are killed are without arms; it is a real massacre which they commit on the males. They must all die before winter. They kill part of them even in the hive; or they cut off their trunk for fear they should suck more honey, so that they soon die of hunger: or else they expell them from the hive as useless mouths; so that the poor exiles must either die of hunger, of cold, or become a prey to birds.

P. Is it possible? their own comrades, with whom they had lived so long at peace, and who composed the court of their queen! in sincerity I no longer like them, no longer at all. Fy! 'tis horrid! But for what reason then do they use their males so cruelly?

M. This is the reason, which perhaps excuses them. The winter is long, the family numerous, and their stock of honey is in general only sufficient for their own consumption and that of the queen. The males who are large, are likewise great consumers; if they were to share their stock with them, it would not outlast the half of the winter: thus the whole state would infallibly die of hunger, and they likewise of course

This is what renders the working bees cruel. Besides the males are no longer good for any thing

thing: the queen has no more need of them; she will have younger ones to impregnate her the ensuing year: they are for no other use, they do nothing but eat. The working bees have supported them idle so long as they could find any thing in the fields: that seems sufficient: they had better die all at once than wait till they have starved the whole state, only to perish along with the rest, Thus the bees reason, or rather nature reasons for them; do you find it very unjust? I believe not. But we forget almost the finest part of the whole history of bees: that of their metamorphosis: for you already know that they are not born winged insects, and that all of them began their existence worms or caterpillars.

P. Ah! yes, dear Sir, inform us then of that; is it the same with them also?

M. Yes, the case is the same with bees: you have seen that the queen deposits an egg in each cell. At the end of two or three days a worm is produced from it, which is furnished with a supply of honey mixed with wax, on which it subsists. When once it has got enough, it is no longer supplied with any more, and the entrance to its cell is closed up with wax. The working bees perform all this. Then, this worm or caterpillar spins it self a texture of silk; and, from a worm is changed into a nymph, that is, the young fly or bee is only surrounded with a transparent pellicle which allows it to see in every direction, (and that is the difference between nymphs and chrysalids, which are thick and opaque, though the two words be often confounded.) This change takes place at the end of six days. The nymph is at last gradually unfolded, and in twenty one days a perfect bee bursts its covering, quits

its deserted prison, and forthwith flies to plunder in the fields with its companions. Others then come to fit up again the deranged cell, and to put it into a condition to serve anew.

This is the history of all these species of flies: The others are,

The mason-bees, who inhabit old walls, and there construct cells with sand and a mortar formed of a viscous substance, which they supply for binding the sand. These cells are oval and pretty large, and remarkably solid.

The humming bees live in the earth, where they cover their nests on the outside with moss, to deceive their enemies.

The wood-piercer-bees execute their operations in old trunks of trees.

The rose tree-bees live solitary under ground, where they construct themselves a charming nest with rose tree leaves: they are only a kind of leave-cutters, of which each prefers one species to another.

HORNETS.

THIS species of fly is three or four times larger than the bee, and much more hairy, of a black and red brown colour, or black and yellow, marked with reddish spots. They have likewise a sting, and hover over flowers like the honey bee. If you have not already seen the originals, you may see a copy in Plate IV. fig. 19.

P. And do they also make honey and wax?

M. Oh! hornets are not so industrious, so good citizens, nor so careful. They only seek food every one for himself, and when they do

not

not easily find what is necessary, they have the impudence to enter by force into the first hive they come at, and carry away like robbers from the stock of the bees, who for this reason maintain always a strict guard before their door, for fear of being harassed by these rascally intruders. The name of hornets has likewise been bestowed on impudent parasites, plagiaries, pretenders, and robbers or plunderers tolerated by the laws.

Hornets generally live under ground in the holes of mice or moles, frequently also in deserted hives, in hollow trees, or in other out of the way places. They construct their nest with dried leaves cemented with a viscous matter, and with the upper part vaulted to defend it from rain and from water, and to make earth and other bodies roll easily off it. Within they form cells for their eggs.

P. In the manner mentioned above; they likewise work then, and can at least do something?

M. Undoubtedly; so that it was doing them too much dishonour to compare them with the rascals mentioned above, who generally know no other art but that of deceiving.

P. Are there many of them in one nest?

M. But too many; there are always at least some thousands in the same nest, and they are likewise of three species, like the bees, males females, and neuters.

P. And do they also expel the males in autumn?

M. Yes, in this they likewise imitate the bees, but without the same excuse; for as they do not imitate their diligence and foresight in making provision for winter, they have nothing to husband, nor do they die the less all of them

in the course of the inclement season, or mostly all.

P. In this way none of them will remain for the ensuing year.

M. Unfortunately they are but too fruitful, and if but a pair survive the winter, there are soon thousands of young ones a-foot.

P. But how do they contrive to live till the spring?

M. Many of them fall into a torpid state for want of food, like the ants, and continue in this situation during the cold season, till they are roused by the genial warmth of spring.

WASPS.

THE name of wasp is common to all those large flies that live on flesh and are not bees; and even hornets are only a species of wasps. Those we speak of, one of which is represented in Plate IV. fig. 12, are both ingenious artists and most industrious insects; it may even be said that of all insects, wasps show most skill in the construction of their dwellings.

P. More even than bees?

M. Yes, even than our dear bees.

P. That is very extraordinary! and how do they do then?

M. In summer they seek out a hole that has been made by some rat, field mouse, or mole, to to serve as the site of their dwelling, and when they do not find one ready made, they set about making one themselves, and digging the ground. For this purpose, they cut the earth into small pieces, and carry it to a good distance from the spot;

spot; they labour at this business with so much diligence, that in a few days they dig a hole a foot in dimensions every way: but then every one assists, males, females, neuters, none are privileged. Whilst some are employed in digging and carrying away the earth, others provide materials: and whilst some are cementing the vault with a viscous matter, others are laying the foundations of their admirable edifice, which in a few days is completely finished.

P That must indeed be a very fine thing.

M. In reality, young Gentlemen, I assure you that I have seen nothing more surprising among the whole works of art. When one sees for the first time a wasp-nest, one would take it for a beautiful rose, a kind of artichoke formed of grey paper, with most inimitable art. I was deceived myself, I confess, when I first got my eyes upon one. It was in vain to tell me what it was, I could not believe it, till I saw with my eyes the wasps going in and coming out, and then I could not refrain from rendering thanks to the Creator, who had furnished me with so fair an opportunity of adoring him anew for the magnificence of his works, and even in the smallest of his creatures.

This curious nest (see Plate IV. fig. 9.) which the most industrious artist would with difficulty imitate, is formed of wood reduced to powder, and kneaded with a cement furnished by the wasps. They go in quest of the wood upon old beams, palisades, on old roofs, &c. They there cut small splinters which they reduce to powder, for forming a viscous paste, making use of their jaws to pulverise the wood, and of their feet to knead it. They next spread and draw out this paste to form their dwelling and continue

tinue to construct it with these thin leaves, till they have completed their eleven stories, with the cells which they contain (Plate IX. fig. 8.

P. Eleven stories!

M. Exactly that number, never more nor fewer. Then the labourers leave the males and females to repose, and begin to seek provisions for the whole family, to which they carry the soft part of rotten wood and honey. The queen deposits in the cells from ten to twelve thousand eggs, within a certain space of time. These eggs are hatched two or three days thereafter: at the end of twelve or fifteen more they become nymphs, and not above eight or ten more are necessary to the complete formation of the wasp, which bursts its covering as well as the door of its prison, that is, the lid of the cell in which it was inclosed, to fly away after the old ones, with the exception of the males and females, who constantly remain in the dwelling.

That they may easily supply themselves with food, they take care to establish themselves in the neighbourhood of hives, or even in empty hives, in hollow trees, in vineyards, near kitchens, shambles, larders, where they easily find honey, wax, meat, fruit, in a word, a table ready furnished. Meat, bacon, liver, cherries, every thing which has a good flavour, is quite to their taste; they are frequently seen transporting in the air pieces as large as themselves between their claws; arrived at the habitation, they leave the whole booty to the discretion of the queen, whomakes the distribution, and who for this purpose goes to the door of each cell to give the larvæ their share, which she puts herself within their mouth.

Wasps

Wasps are still more to be dreaded for their sting than bees. Should one only insult an individual, they come forth in a body from their nest and fall on the face of the aggressor; for they are instantly advertised by the sentinels, who are constantly on duty both at the gate of entrance and of exit. Besides, as they are robbers, they must be warriors, seeing that the bees are not very tame either, when they come to carry off their honey.

P. And can the wasps then make their way into a hive, in spite of the bees?

M. What can bees do? hornets (Plate VIII. fig. 13.) and wasps are furious robbers. The bees in vain keep a strict guard; frequently all their sentinels are massacred and though at the expence of several of their own lives, still the plunderers at last find means of penetrating even to their stores.

There are different species of wasps as well as of bees; they do not all live in society, and there are some solitary, who build neither nests nor cells, and live as flies, gnats and other insects. Some deposit their eggs in wood, others pierce the belly of caterpillars or chrysalids to deposit their eggs there, others place them on all sorts of leaves. Green caterpillars, for instance, which so often destroy the rose-trees, and leave nothing of the leaves but the nerves, are the larvæ of wasps. These different species of solitary wasps have received names of course; some are called gall-wasps, others ichneumon-wasps, others wood piercers, &c.

GALL-WASPS.

THESE (Plate VII. fig. 30,) puncture the leaves and tender branches of trees, shrubs, and plants, and thus produce tumors and knots in the form of nipples, which have the appearance of fruit, but which serve to lodge their eggs: these are the excrescences which are called galls, of which we have already mentioned the nature and the use. So long as the larva lives, the tumor which surrounds it, grows nearly as in fig. 31, and becomes considerably hard: but if it die, the gall remains small as fig. 32, soft, and soon falls off.

There is a species of these wasps which attaches itself to the rose-tree, both the wild and cultivated species, of which it wounds the young tender buds, to deposit its eggs in them. A reddish excrescence is thence produced, which is rough like-moss, and which in different countries gets the name of rose-sponge, sleeping-apple &c. This was formerly in great repute against witchcraft; so that the good women fixed one of them to the neck of children to preserve them from it, or when they wanted them to sleep, made them drink a decoction of it.

ICHNEUMON-WASPS.

THESE obtain their name from their warlike and bloody dispositions, and are of several species. Some roam every where in quest of living

iving caterpillars, upon garden walls, trees, palisades; they then pierce their belly and deposit their eggs, so that the caterpillars become sick, and die before their change into chrysalids, or soon after. Thus when we think we have the chrysalis or the larva of a butterfly, we are surprised to find in its stead the larva of a wasp which is changed into a nymph some days after, and which is not long in becoming a winged insect but very different from a butterfly. Thus these species of wasps serve for the destruction of caterpillars, and other voracious insects that are pernicious to our gardens.

There are other ichneumons which make holes in the earth, and then seek some large caterpillar which they lame or wound in such a manner that it may live some days; they then carry it to their hole and deposit an egg, then cover it with grass or foliage, and watch for some days with great care, lest some enemy should undo their labour. When the egg is hatched, the larva which is produced from it devours at its ease the carcass of the caterpillar, is changed into a nymph without leaving the hole, and only quits it after it has become a perfect wasp.

THE WOOD-PIERCING WASPS.

THESE form their nests in pieces of old timber, which they pierce and hollow out with their stings, and in which they deposit their eggs; the larvæ produced from them find a ready subsistence, because they live solely on rotten wood during two or three years; after which they become nymphs and at last wasps.

L 5.

VI. CLASS

VI. CLASS OF INSECTS.

P. Have not we only, dear Sir, two other classes of insects to examine?

M. Do you recollect that still?

P. Oh! certainly; we have still insects with two wings, and then such as have none.

M. Thus we shall soon be acquainted with all the insects: we shall next make an excursion to fishes, and then we shall visit other families.

To dispatch our sixth class then, we have only to examine flies, gnats, ox-flies which deposit their eggs on the carcases of animals, and even on living animals, or in nasty infected places; though some of them are oviparous. The worms produced from these eggs remain there and eat till they have passed their nymph state, during which they are of a brown or sallow colour, and are furnished mostly with a long tail. Several insects with two wings have a sharp trunk; others have a flexible one; others have neither trunk nor sting, not even a mouth, but only three sunk points.

P. How! no mouth?

M. No; neither mouth nor trunk.

OESTRUS

OESTRUS AND TABANUS.

THE GAD-FLY AND THE OX-FLY.

But it is probable, that these three holes either serve the gad-fly for sucking and drawing some little juice from those living bodies to which it attaches itself, or that when arrived at the state of a perfect insect, it has no longer occasion for food, which is not extraordinary. We must not confound it with the tabanus or ox-fly which likewise deposits its eggs upon animals, but, which has such a cruel sting, that it torments cattle to such a degree as to render them furious, as we have seen happen to cows, oxen, horses, asses, stags, goats, rein-deer, &c. There are produced from these eggs great round worms, which continue sometimes through the whole winter in the skin of those animals whose blood they suck, and where are there changed into nymphs. We observe on the skins of horned cattle, tumors which are produced by these larva as they grow and extend themselves.

There are four species of the tabanus known, which differ all in respect of colour and size.

1. The tabani of cattle, which deposit their eggs on oxen and cows.

2. The tabani of rein-deer, which torment particularly this animal so useful in northren regions.

3. The tabani of horses, which deposit their eggs in the anus of horses, that is, at the orifice of the intestines under the tail. This is a species of gad-fly which has no trunk, and it is believed

to be viviparous, since as soon as it has deposited its hatch in the entrance of the bowel, the horse becomes furious and unruly. However that may be, the worm penetrates up this canal to the stomach, and there remains till the period of its metamorphosis; it then suffers itself to be carried along with other matters, and falls to the ground where it digs a hole, to be changed into a nymph and become a fly in its turn.

The tabanus of sheep (the fly of the nose-worm of sheep) which penetrates by the nostrils into the cavity of the head in sheep, goats and stags; and there deposits its eggs: this also is a gad-fly. In England the sheep are terribly tormented with the worms produced from these eggs; they are rubbed by way of remedy, with an ointment prepared of tar, salt, and butter.

There is still another species of tabani, brown and reddish, which resemble very much the common large flies, and which fix on cattle, whose blood and juices they suck with their piercing trunk; but this species does not deposit its eggs there, it deposits them in the earth.

FLIES.

If we be not well acquainted with the species of these troublesome insects, it is not for want of seeing them about us, since they surround us almost through the whole year, and scarcely cease to plague us in winter. During the continuance of summer nothing can be preserved from their ordure; they have even the impudence to attack our hands and our face, and occasion us by there
puncture

puncture troublesome enough swellings, which disfigure our looks.

There are a vast number of species of flies, which have all a flexible trunk, and deposit their eggs upou meat both fresh and salted, on carrion, on cheese, on every thing that comes out of the bodies of animals, and in all nasty places. Some however are viviparous, as we mentioned before. The species of flies that are best known are; the house-flies, the blue flies, the garden-flies, and the wood-flies.

The house-flies, deposit their eggs in all kinds of damp and nasty places, and not on clothes, walls, books, tables, wainscotting, &c. They cover all these things with small black points, which are their excrements, and not their eggs: were these eggs, flies would increase to such a degree as to devour us all, especially such people as lived near dung-hills, sewers, and even in low apartments. All these flies come in by the doors and windows, and continue as long in our houses as they find any thing to eat; we see them going out and coming in every moment. But, at the end of the season they die mostly all, a few excepted, who find means to conceal themselves in corners, where they continue to live till spring. The same instinct which teaches other insects to deposit their eggs, (which none of them hatch) only in places where their offspring may easily find subsistence, leads flies to do the same in respect of their young, which are called worms. These worms eat a great deal and grow till they become flies in their turn, and then they grow no more: the small flies continue small flies, and there are some which can scarcely be distinctly seen without a microscope: but there

there are likewise some almost as large as hornets.

The blue flesh flies have on the hinder part of their body a beautiful spot of this colour which has occasioned the name. They deposit their eggs, as is but too well known, on meat, or on the carcases of other animals. These eggs are hatched on the same day, and on the nine days following the worms eat so plentifully, that they are in a condition to be changed into nymphs; in this state they continue nine or ten days more, and then make their appearance as flies. These nymphs are of an obscure red, (Plate, IV. fig. 17.)

The garden-flies or wood-flies fly in companies or swarms in gardens and in woods, especially in fine weather, and perform a thousand evolutions without order, rising and descending incessantly.

STINGING FLIES.

THIS species is distinguished by this name, though all the rest sting likewise, because they have a remarkable long sting, which makes, them the constant torment of horses and cattle, of which they sometimes draw blood, particularly in warm weather. In other respects they resemble house-flies; and in rain they also enter into houses, and make us feel them most cruelly, especially in our legs and feet.

ASILES.

ASILES.

THESE are as large as the house-flies, have the legs and the posterior part of the body covered with hairs, a long mouth armed with two hard jaws, which serve them for seizing and devouring a vast quantity of other two-winged insects.

GNATS.

THESE small insects so troublesome and so well known, have a body straight and longish, and a trunk armed with stings like brushes, with which they suck the blood of animals, and particularly of man. They are very brisk, very lively, very active; we see them constantly leaping, bounding, fluttering, and hear them buzz wherever they are.

They deposit their eggs in pooles, marshes, ponds, ditches of stagnant water, into which they let them drop, by resting on the stalk of some herb or some piece of floating wood *. The larvæ that are produced from them, live in the water where they subsist on pucerons and other aquatick insects; and the nymphs even remain there until the gnats come forth and take wing.

There

* Bornare and other naturalists whom he quotes, French and others, assert positively that the eggs of gnats, instead of being deposited in the water, are glued to the leaves of aquatick plants, as also their nymphs.

There are several species of them, the best known of which in this country, are the buzzing gnats.

FLIES WITH LONG LEGS.

IN reality their legs are of an immoderate length: their trunk on the contrary is short and turned backwards. They frequent gardens and meadows, and do injury to nothing; but they deposit their eggs in the ground beside the roots of plants, to which the larvæ of course prove very injurious. Nevertheless, they likewise frequent marshes and dung hills for the purpose of depositing their eggs. Some are large and some small. They are called tipulæ.

LEAPING GNATS.

THESE resemble much the small species of flies; they are mostly of a blackish colour or an ash-grey, and fly at night collected in vast numbers, as if they were dancing in the air.

The gnats that are seen leaping on dung-hills are of the colour of brick.

VII. AND LAST CLASS OF INSECTS.

THIS last class presents to us a great number of species that are very different one from the other

other, in respect of size, shape, place of abode, food, organs, the number and length of their legs, the number and size of their eyes, and lastly their manner of multiplying; for some of them are oviparous, and others viviparous. But they all agree in one respect, that is in wanting wings.

It were easy to institute new classes of insects without wings, as has been done by dividing into six classes, those which have wings; nevertheless they are comprehended under one, which is therefore very numerous. It comprehends fleas, lice, spiders, scorpions, scolopendræ, tuli, woodlice, lobsters monoculi, &c.

FLEAS.

THESE are wicked little insects, which we often wish to get rid of without being able to accomplish our purpose; they are such good leapers that they easily escape our attempts, and go over the whole surface of our body with impunity. They subsist on our blood; and though they advertise us by their bite, and indicate to us at once the place of attack, we are not always successful in preserving ourselves from a bleeding.

This insect has two grand resources to escape our fingers; its excellent eyes; which are formed of a number of other smaller eyes, and especially its nimble and elastick legs, which carry it out of sight in an instant.

P. But where is their common place of abode, from which they come to bite us when we are least suspecting them?

M. In old rags, in dirt, dust, straw; they lay eggs and multiply fast; every month in summer there

there are produced an host of young ones. They are excessively troublesome to men and other animals; but after autumn they are killed by the cold; and in cold countries as Iceland and Greenland, there are few or none. There are some people whom they attack in preference, like the the bugs, and who are cruelly abused by them. But attention and cleanness put them away, and indeed it is the only way of getting rid of these troublesome blood suckers*.

LICE.

THE same may be said too of these tormentors of so many of the human race; though some species of them are very difficult to get rid of when once they have taken possession of, and nestled in our clothes, &c. No quarter of the world, no country, no animal even, is exempt from these parasitical insects; there are some even upon animals which live in water. And what is worse, lice multiply with astonishing celerity; a female becomes a grandmother in the space of a single day, and in three or four weeks she has an offspring of two or three thousand. It may be said that of all the insects that trouble mankind, these are the most troublesome. They nestle in particular among our hair, and there they frequently torment poor children to such a degree as to leave them no rest either day or night; these poor wretches weep constantly, lose all their vivacity

* One thing must not be forgot, which is, that fleas are not produced from eggs; a larva only is brought forth, which must undergo a metamorphosis similar to that of winged insects.

vacuity, become sick, and frequently die in consequence. There are even instances of people being devoured by lice, not that they were eaten up just as a cat eats a mouse, but so bitten, gnawed and exhausted, that at last they died of it. These troublesome insects insinuate themselves under the skin, and there make galleries and trenches, like rats and moles in the earth. Thus though these little insects be very curious in respect of their structure and shape, in the same manner as fleas; still they are a troublesome and perfidious race, in regard to which we are obliged to do violence to our inclinations, which would lead us to preserve the life of every thing on which providence had bestowed that celestial blessing. It may be said that the All-powerful being has presented us in this small animal with almost the master-piece of insects, which are themselves all so many master-pieces: but we must examine it with a microscope. Further, it changes its skin several times in proportion as it increases in size; but it changes no longer when once it has become capable of generating, and then it multiplies astonishingly. Its eggs are what are called nits, and which are frequently seen among hair that is ill taken care of: many of them die before they are hatched, because they always require for that purpose a moist warm place.

HAND-WORMS.

THESE too are a species of insects that are no less troublesome, and equally curious with the former; but they are so small that they cannot be distinguished without the use of a microscope
even

even though there be several of them together. Nevertheless they have eight legs, each formed of eight articulations, two antennæ and two eyes in the head which is pointed; and their body is composed of twelve rings, including the head. With the assistance of a glass we discover all their members and their movements, and we distinguish even the circulation of the blood in their small vessels. What minute organs! They likewise penetrate under the skin, and there form galleries like field mice and moles under the turf. There are a great many speices of them, of which the best known are those of cheese, (more commonly called mites,) which appear to the eye only like fine dust; and those called spinners, because to them are imputed those whitish threads similar to the long threads of the spider, which are found in the end of summer and also in autumn, in meadows, fields, gardens, where these insects haunt, and which are called virgin-threads; though they be likewise imputed to a species of the spider

THE WOOD-TICK.

It is also called in certain countries, shoemaker, or weaver, or wood-spider: it is an insect which in reality somewhat resembles a spider, on account of the great length of its legs, and which travels particularly in the night time. It has its eyes on the back, attached to a kind of pole. Its legs continue in motion long after they have been torn away. It frequents retired and remote places.

THE BOOK-

THE BOOK-TICK, OR PAPER TICK.

It is nearly of the size and colour of a wood-louse, but resembles a scorpion, excepting only that it wants a tail. It inhabits the chinks of old houses where there is some moisture, and likewise among old papers, that are not kept dry, or in libraries and in collections of plants, and there it commits havock.

SPIDERS.

THOUGH we have commonly an aversion to spiders, they are not such disgusting insects as lice: besides they do no mischief, and in particular are not poisonous notwithstanding the common opinion: so that they might be swallowed and eaten without danger, if we could get the better of our aversion. Meat of all sorts, flesh, fruit, bread, pastry, milk, &c. may be left within reach of spiders; they meddle with nothing, they spoil nothing, they pollute nothing; and if they sometimes draw a thread over them, it is only to catch the flies that would meddle with them. Thus we are wrong in having such an abhorrence at them: we ought rather to be kind to them, and see them without regret extend their webs, which are a certain means, and almost the only means for preserving us from flies, as well in our houses as in our gardens, where the fruits which they surround with their threads grow secure against every attempt, till the moment they are brought
to

to our tables. For my own part, I could be well pleased to see spiders webs every where, to see these hunters spread their toils every where for those enimes that molest us*.

P. Goodness! dear Sir, is it possible? the villainous spiders!

M. Why villainous? in what respects are they more villainous than other insects, with their long legs, so delicate, so fine, so supple, so dextrous; their head and their body divided like that of flies, of the most beautiful of the beetles, and of our charming bees? with their web ten times finer than that of our charming silk worms, and which might be useful to us in more ways than one? with their innocent dispositions, which hinder them from spoiling any of those things that are for our use, and which render them cruel only to our enemies? In truth, when I see a little master, or a pretty miss, frightened and fall into a faint at the sight of a spider, far from having any compassion for them, I can only laugh at them; and if I feel any pity, it is only for their want of good sense. People ought long ago to have learned to have neither affection nor aversion for any thing, but according to the good qualities it possesses. Try to amuse yourself in summer, with setting spiders to assault flies, and I am sure you will derive more pleasures than one from it; first that of an exhibition highly curious, and afterwards that of being less incommoded by flies.

There are forty seven species of spiders, all different in size, colour, and shape; some are yellow,
some

* We have seen in an extensive boarding school for young people, the store-master preserve carefully a great number of spiders in a large place where the clothes were kept. Long experience had taught him to adopt this method.

some white, some black, some green, some red, some grey, some spotted: some are so small as scarcely to equal the size of a louse; but some are so large as nearly to equal the size of a small egg. All of them have much resemblance to lobsters.

Some prepare their webs in open air, and fix them to posts, walls, trees; others make choice for that purpose of the corners of walls and of wainscottings; others content themselves with spreading some threads before chinks and holes; and lastly there are likewise some which do not spin at all. We see some whose fine slender threads are at a great distance from one another, such as the cross-spider; some whose threads are coarse and close, like those of the house spider; some of their nets have the shape of a wheel, and others have different figures. Further, all of them spin these threads from the hinder part of their body, and some of twelve slips or twists.

The disposition of these animals is unsocial; every one lives for himself alone, and if one of them venture within the toils of another, there is a desperate engagement, till the stronger remains master of the web and the booty.

They deposit forty, sixty, or fourscore eggs in a parcel which they inclose with a covering of fine silk, and so close that one would take it for a cocoon of the silk worm, and that the eggs resist the greatest cold under this single cover. They suspend this parcel in any corner. There are likewise spiders which content themselves with fabricating a more slender covering for their eggs, but in return carry this parcel fixed under the belly till such time as all the young be hatched.

Spiders have eight eyes, and eight legs more or less long, fixed to the corselet. They subsist
on

on flies, gnats, and other insects which fall into their nets, and seldom escape them. Fig. 1 of Plate VIII. represents a spider in pursuit of a fly. When they can no longer find any thing to eat, they may be tamed so far as to come and take what we chuse to give them. They may even be accustomed after a long while, to eat crumbs of bread: but they always prefer flies and gnats. Of these they every year devour hundreds of thousands, and it is to them in particular we are indebted for not being overwhelmed with an innumerable host of these troublesome insects. In reality, think but a little, what a frightful host of them we should have around us, if the toils of the spider were not every where spread to rid us of them. We have seen a striking example of their utility in this respect, and of the singular use they are of to us. A man who had a small vine-arbour, taking it into his head that spiders hurt the grapes, was at pains to destroy all those which he saw upon his grapes, so that he pleased himself with anticipating what fine grapes he should have that season; the very reverse; he had not a single one which was not half spoiled by flies and gnats.

Convinced of the mistake he had committed in destroying the enemies of his enemies, he took care not to fall into the same, the following year: but when he saw in the same manner the flies and gnats approach on one side of his arbour, and the spiders on the other, he left them to themselves, and his grapes came to great perfection.

P. But are the spiders webs good for nothing? some of them are so beautiful!

M. Not that I know of: we have not yet found out the way of employing them to advantage.

tage. It is true a certain Philosopher has, many years ago, had gloves and stockings made from the silk of the coverings with which spiders enclose their eggs, after being well washed and twisted. But when more considerable trials were made, it was found that as such a vast number of spiders were necessary, and as spiders kill one another, (which made it requisite to keep them separate,) this silk would cost infinitely more than that of silk worms, which is also more beautiful, because that of spiders is too fine. Besides, the leaves of the mulberry tree are much easier produced than the prodigious quantity of flies that would be necessary to subsist thousands of spiders.

It is curious to observe a spider working at her web. She begins by fixing a thread to some part, she then allows herself to fall and continues suspended by the thread at a certain height, where she seeks to fix a second thread; she then forms a third, and afterwards crosses them one upon another till the whole work be completed. She keeps some retired corner to withdraw into when afraid of any thing, as well as to observe her prey from thence, and all the threads generally meet in this corner, which is in the center of the web: thither also she transports her prey for the purpose of sucking it, unless it be very small, and then she consumes it on the spot.

Spiders live three or four years, and every year grow somewhat, until they have attained the size of the species to which they belong. Each spring they cast their skin, as lobsters do their shell.

They are distinguished into mason-spiders, house spiders, garden-spiders, field-spiders, and

aquatick spiders. We must take notice of the most remarkable.

HOUSE-SPIDERS.

THESE are they whose strong thick webs we see fixed to the windows of houses and in corners; when a poor fly stumbles on one, they run from their hole, surround their prey with a covering so that it cannot escape, and then suck it at their leisure.

CROSS-SPIDERS.

THEY are named thus on account of a cross of white spots which they have on the back; they live in gardens and in the open air among trees, bushes, &c. They are of a brown colour and give their web the shape of a wheel; they are the largest spiders of our country, though not larger than a small nut.

THE BIRD-CATCHER-SPIDER.

THIS is found at Surinam and only in the southern parts of America; and is the largest of all the known spiders. It is strong enough to catch small birds which it surrounds with its web then sucks as well as their eggs: as to the colobri or bird-fly, this admits of no doubt or difficulty, since the bird is smaller than it, not being larger than

than a may-bug, whilst the spider is as large as a child's fist. There is likewise a species of this size, whose webs are strong, large and gilded, in the same manner as the cods in which they inclose their eggs. The silk of these might be of good use.

TARANTULÆ.

THESE, as they are the most defamed, so are they the most remarkable of all the spiders, and one of the species named phalangium. They have obtained their name from the village of Tarentum in Italy, in the kingdom of Naples, near to which they are found in great plenty in the vineyards, fields, gardens, &c. It was long believed that people bitten by these spiders, fell into a kind of delirium or madness which was cured by musick and dancing. But experience has discovered all this to be false, and it has been found that those who pretended to be ill of this bite to get money by exhibiting themselves, were impostors, or foolish people employed by knaves, who find means to gain a subsistence in this way. People of this description are still seen going about Italy, who are made to dance every where, and are never cured, because the money which they get in this way preserves in them the inclination to be ill.

AQUATICK SPIDERS.

THEY are of a dull red colour, about the size of house-bugs, and live constantly in water, in pools, ponds, puddles, where they subsist on water-pucerons and other small insects, (Plate VIII, fig. 14.)

There is another species of aquatick spider, almost entirely similar to the land spiders, but whose manner of living is infinitely more curious. It lives in air, in the middle of water, and runs equally upon land after insects. Its body is hairy and oily, so that the water makes no impression on it, and when it comes to the surface it always carries away a bubble of air along with it. It makes use of this to form a habitation for containing itself in the water by inclosing in a silken bag all the air bubbles which it collects. The male forms a communication between his habitation and that of the female, and these together present a spectacle scarcely to be equalled in nature, which seems to realise the accounts we have read of the palaces of nymphs and faries at the bottom of the water.

SCORPIONS.

THESE insects have eight eyes *, two on the back and three on each side of the breast; eight long

* Bomare who almost constantly copies from other eminent naturalists, gives them only two eyes; farther, he takes no notice of scorpions without a tail.

long legs, and two pincers that are still longer at their head, similar to those of lobsters and which enable them to sieze their prey, flies, worms and other insects.

The most part of scorpions have a long tail which they turn up upon their back and above their head, and which is terminated by a sting, the punctures of which are venomous and deadly. In the time of the children of Israel, scorpions were a plague in Eygypt and in Canaan. Nevertheless some scorpions have neither tail nor sting.

There are large scorpions and small, from the size of a house bug to that of a may-bug and even larger. One of these large ones is represented in Plate VIII, fig. 3. They are diffused almost over the whole world; but they are very frequent in warm climates, though they haunt moist fresh places. There are some red, white, brown, reddish, black.

SCOLOPENDRÆ.

THESE are a kind of small insects that inhabit the earth, where they eat worms and tender roots, and which are likewise called millepedes on account of the great number of their legs, though they have only from thirty to a hundred and twenty*.

M 3

TULI.

* Bomare makes them inhabitants of both fresh and salt water, rotten wood, &c. and gives them so many as two hundred and forty legs.

TULI.

THESE are another species of millepedes, but different from the scolopendræ, by the roundness of their cylindrical and long shaped body. They have two hundred feet on each side, and of course are of all animals the best provided. They inhabit the earth, dunghills, rotten wood, where they are often found with scolopendræ, Plate VIII, fig. 10. and 11.

PALMERS.

THEY have a body of a flat oval shape, the upper part scaly, and are of a blackish grey. They have two antennæ with hoops, a kind of stump of a tail, and fourteen whitish feet. They are found in houses, in moist damp places, of course particularly in cellars, under flower-pots, and in other similar situations. They can roll themselves up like a ball, there are different species of them; that which is best known by the name of millepede, is sometimes used in medicine.

DEATH-WATCHES.

THESE insects are the most destructive to collections of books, papers, plants, &c. They gnaw wood with so much vigour, as to be distinctly heard in the silence of the night, and as weak imaginations

ginations are frightened at every thing, some have imagined that this noise foretold death, whence this insect has received the dismal name of the death-watch.

LOBSTERS OR CRABS*.

AFTER the molucca crab, the lobster is the largest of all insects. There are some that weigh no less than seven pounds, as the *hommar* or great lobster: and others which are not larger than a child's little finger, as the hermit. Some of the hommars are more than two feet in length and broader than the hand of the largest man.

Almost all lobsters are of a reddish colour, and have two very long antennæ, eight long legs, and two arms that are still longer, furnished with pincers near the head, which they use for seizing their prey and for defending themselves; two large eyes composed of many smaller ones. They inhabit rivers, brooks, lakes, ponds, and subsist on fishes, snails, frogs, and all sorts of aquatick insects. They live no fewer than of twenty years. See Plate V, fig. 43.

Lobsters commonly deposit their eggs in water, but there are likewise some which carry them fixed under the tail till such time as the young be hatched. Lobsters when newly hatched are very small, but they grow daily; and when their cover becomes too strait, they cast it all in a piece from head to foot, so that one would take them for two lobsters instead of one.

M 4

They

* Strictly speaking, these two insects ought to be distinguished, the crab having a round shaped body; but there is no inconvenience in making them two species of the same genus.

They are stupid and quarrelsome animals, never cease squabbling and fighting with one another; and sometimes even eat one another. Nevertheless they live in society, in holes under water, or under stones that are there, and many of them are taken there; for they are, as you know, a dish in great estimation. You probably know likewise of what colour they are when boiled? they may likewise be made red while living, by sprinkling them with spirit of vitriol, or even with spirit of wine. They are better in the months of May, June, July, and August, than in any other season.

You perhaps know too that this insect does not run fast, at least out of the water, and that commonly it goes backwards. But have you observed four other small antennæ or barbes situated beside the large ones, eight or ten small legs under the tail *, and little white stones in their body, improperly called crab's eyes, and sometimes used in medicine?

P. As to that, no: but we have often seen how stupid they are; for on putting between their pincers one of their own legs, they squeeze it, and so strongly as sometimes to break it, and then throw it away.

M. Yes, the lobster is a very stupid animal: it likewise cuts off one of its pincers with the other in the same manner; and we must suppose that it thinks its claw between the hands of some enemy whom it likewise has a hold of at the same time. But nature has conferred a great privilege upon it, for which it is well worthy of being envied by men: namely, that when it loses a leg or a pincer, another is produced which is in condition

condition in a few weeks, though it always remains smaller than the corresponding limb.

P. Ah! that may perhaps be the reason why we have taken some that had one large limb, whilst the other was quite small; may it not, dear Sir?

M. Exactly: but how came you to eat lobsters?

P. But, dear Sir; should we not eat them?

M. Fy! a nasty insect, which resembles a spider with its long nasty legs, and its pincers, and its antennæ; fy, it turns my stomach the very thought of it! I think I have a spider on my tongue.

P. Oh! we are no longer afraid of spiders, since we know that they do only good and not hurt, and that they are not venomous. But I should however feel some reluctance to eating them.

M. That is not necessary; though even in that case you would not be the first; but I am quite happy to see you already so reasonable, and that you know to regulate your affections according to the merit of objects. For instance, you must be taught to do justice likewise to the conduct of the lobster, who has been basely calumniated in a certain fable which you have no doubt seen. It is said that the mother lobster wished to correct her daughter's going backwards. What answer did the daughter give?

P. She replied to her mother; go before, I will follow.

M. That is, she laughed at her mother, as if a mother might not be allowed to wish that her daughter should be better educated than she had been herself! I am sure none of you would give

so insolent an answer to his father or his mother.

P We should be very sorry.

M. I believe it; you have too much good sense to commit so unnatural a fault. But there was no occasion to tell a lie, for the purpose of giving children so bad a lesson as this, and of imposing on them likewise, by making them believe that lobsters could only go backwards, whilst you must have remarked, as I have done myself, that they can go forwards very well. Thus are we calumniated by these composers of fables! From such a fact as this, a better moral may be drawn than that of the fable in question.

CRABS.

THERE are several species of crabs, one of which has some resemblance to a bag, whence it has obtained that name in some countries. Its head is covered by the upper shell see Plate V, fig. 41.

There are some crabs with naked tails which retire into empty shells of other fishes; they have different names, some of them singular enough, as the crab of Diogenes, the crab of St. Bernard, the solitary crab or hermit, &c. One of them is represented in Plate XI, fig. 9. The reason why they retire into these empty shells, is because they are afraid of their tails, which wanting shells would infallibly be eaten by other crabs. Thus they cram them into these shells, and only put out the head to watch for their prey.

P. Very well, master crab! and no doubt he takes care of his shell and carries it about with him

him, till such time as he becomes too large, and that he finds a larger one to answer him?

M. Alas no! he cannot carry it about with him; but if he wishes to preserve his tail in safety, he is obliged to continue on the spot where he found his shell, without stirring, and it is at the risk of his dear tail that he ventures abroad in quest of a larger shell, when he finds the present too small for him. It is a dangerous enterprize, and more than one St. Bernard has lost both his tail and his life in the attempt; more than one Diogenes has not had time to find another tub.

P. The Philosopher Diogenes the cynick; is it not, dear Sir?

M. How! Diogenes the cynick?

P. Yes, he that had only a tub for his house, and for moveables, a sack, a staff, and a plate.

M. Just like our crabs, who in reality resemble a cynick in his tub; or a monk in his cell, or a hermit in his cave, as the famous friar Bernard, who has been canonized.

MOLUCCA-CRABS.

THESE are the largest of insects, since they are the largest of the crabs, and lobsters. They are of a singular shape, being about four feet in length, by about one in breadth or thickness.

MONOCULI AND BINOCULI

THESE are very small aquatick insects, called likewise water-fleas, which attatch themselves to

aquatick plants. Some of them have only one eye, and which have for that reason been called mon oculi; this was the opinion formerly, but some people assert it as undoubted (without quoting however observations or authorities) that they have even more than two eyes, which are collected to a single point, and form but one: which comes to the same thing. Others are binoculi, or have two eyes.

FISHES.

THESE are animals whose heart has only one ventricle, and one auricle; who have their blood red and cold, two gills for breathing, two eyes, and commonly inhabit the water. They subsist on insects and aquatick plants, water-lentils, frogs, mud, on every thing that is found in water, and the larger species even prey upon the smaller. They multiply by laying eggs, and live from two, six, eight, ten years, even to two hundred. Some people even believe that fishes never die, so long as the water continues. Further, there are likewise some fishes which are viviparous.

Fishes have no feet; but in return they have parcels of tendinous fibres, covered and tied together by a thin membrane, which are disposed something like a fan or a wing, and situate near the gills, upon the back, under the belly, at the hinder part of the body, and at the tail; they are called fins.

It is by means of these membranes, thus stretched upon light substances, and also by means of an air bladder situated in the abdomen, that fishes

swim

swim and move in the water in every direction; and without these organs they would be under the necessity of crawling at the bottom of the water like lobsters. Thus when we cut off from a fish any fin, for instance, that of the tail, then it can no longer swim forwards, or at least it finds great difficulty in moving forwards a little by means of its other fins. If we cut off those of the sides, then it obeys the current of the water, and can no longer support itself in its natural posture, with the belly undermost. If we deprive it of those of the back, and the hinder part of the body, it can no longer turn itself, or rather it swims no longer, but it is obliged to take the direction of the water.

The generality of fishes have an air bladder, in their body which they inflate to raise themselves by rendering them lighter than the water, and which they compress or empty of air to render themselves heavier. Such as want this bladder, as flounders and ground-fishes, or those in whom this bladder has been opened, are forced to continue at the bottom of the water and cannot rise to the surface.

P. But do fishes always continue in the water, night and day, winter and summer?

M. They take good care not to leave it, for were they only to remain a few minutes out of it, they would suffer extremely if they were not killed in consequence of it. The eel only, can remain out of the water as long as it chooses.

P. But, how do they in winter, when the water is so cold, and even frozen: do they not die?

They are not cold under the ice, as you imagine, and besides, fishes then swim nearer the bottom. It is true, if the water freeze to the very bottom, they must perish; but that seldom happens,

happens, and provided some holes be made in the ice, which covers them and keeps them from the cold, to afford them air, they are found at the end of winter fat and in good health. Besides, the greater part of fishes prefer cold water; the colder it is, the faster they multiply, the fatter they grow: as a proof of this, the farther we advance northwards, the more we find the seas stored with fishes: it is in the frozen ocean, for instance, that herrings are found; and the cod are at no great distance.

P. But, why then is air necessary to them under the ice, since they are in water?

M. They are in water, but even in water they must have air, which they find mixed with water and which they breathe by swallowing the water; this small quantity of air would not be sufficient for us, though it is for them; they swallow water by the mouth, and throw it out by the gills; and it is in this passage, that they take the quantity of fresh air for which they have occasion. It is for this reason, when taken out of the water, you will see them constantly opening their mouths, and moving their gills; they have then too much air; they faint.

P. But do not fishes at last become too wet, and do they not fall sick in consequence of it?

M. Not at all; they are not wet: you easily perceive that they are covered with a hard and oily coat called scales, and such as want them, have at least a thick and fat skin, which water cannot wet, or penetrate; so that the flesh of a fish is not wet. These scales are laid one upon another, something like the tiles of a roof: they are of a cartilaginous matter, and sometimes so small as to be with difficulty distinguished, whilst

whilst in other instances they are as large as a crown piece,

Eels and some other species are viviparous: all the rest are oviparous, and there are produced from their eggs little animals resembling worms, but which finding plenty of nourishment grow rapidly.

Some fishes sleep in the night and seek their food in the day: others, the reverse.

They possess five senses, namely, sight, hearing, smell, taste, and touch; but they want a voice: only there are some which, when pursued, when taken, or when killed, give a hiss, or a kind of a groan, or grumble. Thence comes the proverb: mute as a fish.

There are a vast number of fishes both large and small, from the size of a worm up to that of an ox, or even of an elephant and greater.

P Oh! dear Sir, is it possible?

M. The whale is much larger than a great waggon-load of hay, and in truth, is the largest animal in the world. For as to the krakens, there is much reason to imagine they are only a fable; but we shall take notice by and by of the story that is told of this animal, about a half league in length and breadth, and which resembled an island when it appeared at the surface of the water. We have further to remark, that these large sea animals, which have their blood red and warm; which are viviparous, which suckle their young, and which are furnished with lungs for breathing, are not classed among the number of fishes, though they live in the water.

There are also great singularities in the structure of fishes: some for instance, can fly; that is leap out of the water, and support themselves in the air at some distance from it by means of their extended

extended fins; others have their head provided with a kind of spear, horn, or sword, which serves both for defending themselves, and for seeking and making themselves masters of their prey, &c.

Some fishes are solitary, and others are gregarious; some like the herrings, perform in shoals journeys of several weeks, and quit their native abodes in quest of other latitudes, while others remain always in those waters which gave them birth: some inhabit only salt water, as that of the sea: others only fresh water, as that of rivers, lakes, ponds; others sometimes inhabit one, sometimes the other.

Most part of fishes may be eaten or applied to some use. They are eaten both fresh, as carp and trout; and salted as cod-fish; herrings are eaten in both ways, and likewise in a third, which is smoaked, as also are salmons. As the females carry the roe, and the males the milt, the former are called roe-fishes, and the latter milt-fishes.

There are millions of people who live almost solely on fishes. Some nations fish only for their own subsistence, as the Laplanders, the Greenlanders, and others, the barrenness of whose soil leaves them no resource but that of taking fishes. But there are also nations who make the produce of their fisheries an important article of their commerce; and we profit by it for if we had always to go to Terra-nova, or to the frozen ocean to catch a herring or a cod, when we wished to eat one, we should be obliged to want them.

But there are people who fear neither the fatigues, nor dangers, attending the voyage, or even the fishery, to supply us with all these to our taste; and we are rid of it for a few farthings which

which we pay for a herring, brought to us from the northern seas.

P. What! is it possible that herrings can be brought from such a distance?

M. You have eaten herrings till just now, without knowing how: you imagined they were taken in our ponds like carps. But the affairs of this world are managed quite otherwise! divine providence has bestowed different inclinations on different men which lead them to undertakings unthought of by others, or for which they are unfit. One constructs a vessel, another embarks thereon, to cross the seas and bring home to us fishes, and other luxuries, from the most distant parts of the world. We are clothed by one, warmed by another; this person cultivates our fields, the other instructs us by his writings; and a third takes a thousand pains to assist and comfort his neighbour. Do we not observe in this reason to admire the wisdom of the Creator, and to render him thanks? and can we without blushing remain unconcerned, and not contribute our endeavours for the public good, since we are willing to enjoy our share of it?

P. But how comes it, dear Sir, that there are always fishes, while so many of them are taken annually?

M. It is true, when we observe the vast quantities of herrings, cod, salmon, thorn-backs, and of all those fishes which are vulgarly called fresh-sea fish, because they come from the sea, we may well be surprised to find the seas, lakes and rivers always equally stocked with fishes. But when we consider on the other hand, the still more astonishing quantity of eggs contained in each female, we shall understand this continual multiplication. In reality, it may be said, that of all animals

animals, fishes multiply the fastest: a female produces every year several hundreds and even thousands of eggs; and after you have seen the roe of a carp, you may for once amuse yourself with reckoning all those small grains which compose the mass; these are so many eggs, and you will be satisfied.

To assist us in getting acquainted with such a vast variety of fishes, they have been divided into four classes. The first class has no ventral fins, such as the eel, the sword-fish. In the second are placed those which have the ventral fins before the pectoral, as the cod-fish, and blenny. The third class, comprehends those which have the ventral fins placed beneath the pectoral, as the mackrel, and flying fishes. The fourth is formed of those fishes which have the ventral fins behind the pectoral, as the carp and the trout.

I. CLASS OF FISHES.

THIS class is formed of those fishes which have a belly smooth or without fins, as eels, torpedoes, sea-wolves, sword-fishes, &c.

THE EEL.

THIS fish, (Plate IX, fig. 5.) has a long shaped body, and seems to be only a water-serpent; it is found all over Europe in rivers, lakes, ponds, &c. Its head is sharp, the belly white, and the back of a blackish yellow; it lives on small fishes, the spawn of fishes, dead fishes and other carca-

see,

ses, and frequently during the night, quits the water for the land, to gnaw fruits and pot-herbs *. It is viviparous like serpents though it contains eggs in its belly; its flesh is much esteemed, and in reality has a fine flavour; but it is fat and heavy, and does not agree with some stomachs.

Eels are commonly two feet long, and three or four fingers thick, though some are taken of twice that size; in the sea some are found ten or twelve feet long, and with a body thicker than one's arm.

An eel is very tenacious of life, and the sections of its body when cut in pieces, continue to move for a long while; it has even been seen escape from the grid-iron, on which it had been laid upon the fire. Eels are flea'd, and as their skins are transparent, very strong and durable, they are used in Russia, for garnishing the sashes of windows; in this country they are used by the peasants for tying together the two pieces of flails for threshing the corn with.

THE TORPEDO OR CRAMP FISH.

THIS fish is found in France, on the coast of Poitou, Aunis, Gascogne, Provence: as also in South America, and other places: but these foreign topedoes differ from ours in their shape; ours are flat and large; the others are long shaped like an eel, but all of them have their bellies smooth. This species of fishes presents a very singular phenomenon, for upon touching it, we feel ourselves

* This is a singular fact which is not taken notice of by Bomare; it will appear very doubtful if we consider that the skin of the belly of this fish is not formed for creeping on dry ground, as in serpents, &c. It can be confirmed by the most authentic testimony.

selves struck with a sudden blow, which, is followed by numbness in the arm: this is even felt tho' we should only touch the torpedo with a stick. By this power of numbing, it defends itself against fishes as well as against men: it subsists on fishes, as also on the entrails of animals that have been drowned. Different experiments have been made upon these fishes, from which it appears that they possess in a high degree electrical powers.

THE SEA WOLF.

THIS fish does not exceed four feet in length and is not above half a foot thick: its colour is a very light blue spotted with black. It gets the name of wolf on account of its voracity; its flesh has a good flavour. It inhabits the northern seas and the Baltick, and even the coasts of England and France.

THE SWORD-FISH.

It is likewise called the emperor fish. It carries on its head a hostile weapon, shaped like the blade of a sword, (Plate XI, fig. 25), five or six feet in length, and half a foot in breadth, which serves it equally for attack and defence. It subsists on sea plants, and sea animals. It is found particularly in the northern seas, in the train of the whale, to which it is a mortal and a dangerous enemy, since it sometimes cuts off considerable pieces of his flesh, and kills him with repeated thrusts of its dagger. Frequent-
ly

ly sword-fishes assemble in companies to attack the whale, and however large he may be, they accomplish their purpose: they even find means to get into his throat, and to cut off his tongue, which is nothing else but an enormous piece of fat, and which they eat greedily. They are very bold animals, and rebel even against man, whom they cause to stand in awe of them.

They are killed with a harpoon like the whale. Some of them are very large, being from eighteen to twenty feet long, and weighing no less than two hundred pounds. Their flesh is good to eat.

This class of fishes, likewise comprehends the fish with a slender tail, the sand eel, the sea-serpent, &c.

II. CLASS OF FISHES.

THESE are the fishes which have jugular and not ventral fins, as the uranoscopi, St. Peter's fishes, cod, &c.

URANOSCOPUS.

THE sailors have corrupted this name into that of *raspecon*, with which they are better acquainted. This fish is very common in the Mediterranean, is about a foot in length, and about the breadth of a hand: it is of an ashy grey colour, on the back, and whitish under the belly; it sleeps during the day, and only seeks its food in the night: it preys upon small fishes. Its name, which signifies

signifies contemplator of the heavens, is derived from the situation of its eyes, which are almost on the top of its head, which is thick set with little tubercles; this situation of its eyes obliges it to keep at the bottom of the water among the sand in order to espy its prey, that is the small fishes which swim above it.

ST. PETER'S FISH

THIS name given by the vulgar, to a fish of the ocean, and of the Mediterranean, of the Baltic, and of the northern sea; has no foundation in any thing like probability. It is nearly of the size of the carp, and its flesh is exceedingly palatable.

THE COD.

THIS fish like the herring, inhabits the seas of Lapland, of Greenland, of Iceland, and of the island of Newfoundland, and all the northern seas. It is equally prolific with the herring: the eggs have been counted in a single female to the number of nine millions three hundred and eighty four thousand eggs. They are taken in prodigious quantities, of which the greater part are salted and dried, to be sent all over Europe, under the name of stock-fish.

The cod is two feet in length, and nearly a hand in breadth, and such as are large are near four feet long, and one broad. Its common food consists

consists of herrings, of small plaises, star-fishes, crabs, lobsters, &c.

Cod is taken in the greatest quantity in north America, off the banks of Newfoundland. This fish cannot be taken with a net, like herrings, and so many others, because it gnaws it and breaks it in pieces; but is caught with the hook. Notwithstanding, the Norwegians and Dutch, take a great number with the net. For this fishery, which continues from the month of February to the end of May, four or six men get into a canoe, and each with a hook fixed to a long line, takes daily about three or four hundred. The fishing goes on in the night as well as the day, and the hook is scarcely thrown into the water, till it be necessary instantly to withdraw it again.

When the cod is taken, and brought on land, it is immediately put into the hands of the beheaders, who cut off its head; thence it passes into the hands of the gutters who open its belly the whole length, and take out the entrails: lastly, part passes into the hands of the salters, part into those of the driers. The entrails are not lost: the English extract oil from them, and the French use them as well as the roe for the pilchard fishery.

The English send out every year above five hundred vessels to the cod-fishery, and take at an average about four hundred thousand weight of dried fish, or stock-fish. The French, the Icelanders, the Norwegians, the Russians, the Laplanders, also take a great deal. Some of the northern nations even make use of the bones for fuel, instead of wood, when that fails.

The cod is a very voracious fish which swallows every thing that is offered to it, or that comes

comes in its way, in so much, that it frequently swallows pieces of wood, which its stomach however powerful, cannot digest.

P. It must have an indigestion then: and does it die of that, dear Sir?

M. Die, forsooth! it were well for our gourmandizers, and as ill for the medical profession; if we enjoyed the singular and perhaps exclusive privilege which nature has conferred on the cod. When it feels its stomach thus loaded, it brings it entirely out by the mouth, that is, it vomits it, and turns it out as we do the pocket of a coat; then, after having completely emptied it, washed and rinsed it in the water, it again swallows it, replaces it as before, and falls to eat a-fresh.

This fish is prepared after different ways, for, the market, by the people who fish it, and thus gets different names by which it is pretty generally known.

III. CLASS OF FISHES.

THESE are they which have the ventral fins situated directly under the pectoral; this class comprehends the sucking fishes or remora, perches, turbot, plaice, soles, mackrel, whiting, barbles, flying fishes.

THE SUCKING-FISH, OR REMORA.

THIS is an Indian fish, about a foot in length, or at most two; and with its head of a singular conformation, which consists in this, that the
upper

upper part or top is covered with a kind of scaly skin in the form of jagged folds or laminae, by means of which it attaches itself to wood, stones, large fishes, with so much force, that it cannot be loosened without being killed. But we must not on that account believe, as some have done, that a single remora is able to arrest the largest vessel in its course, which has given occasion to its name. When a number of them adhere to a small vessel, they may perhaps retard its progress, but they never can retard that of a large vessel, to which, however, notwithstanding its rapidity they continue to adhere and thus to follow.



THE GILT-HEAD.

THE head of this fish seems as if mutilated and abrupt, the mouth is furnished with small teeth, it has a large fin of great length on the back, and the colour of its skin is yellow and shining. It is from four to five feet long, and one foot at least in breadth: it inhabits the ocean towards the coast of Africa. Its flesh is fat, and tastes like salmon. It is said to swim the fastest of all fishes, and is so extremely voracious, especially of the flying fish, that if a hook is presented to it covered with some feathers near the surface of the water, it darts upon it, and thus runs on its own destruction while expecting to seize a prey.

THE TURBOT.

THIS is a small fish about half a foot in length, which utters a sort of murmur or groan when taken. It is caught in great plenty in the North, in the Elbe and in the Eider, and even in our own rivers. It is eaten with butter and vinegar. There is a species of this fish in Languedoc called asses head, because the head is very large, almost larger than its whole body, and which is not above half a foot in length. It is frequently in those waters in Europe, which have a stony gravelly bottom. In the day it conceals itself among stones, and roams in the night. The female is endowed with a singular instinct. She makes a hole at the bottom of the water for depositing her eggs, which she watches assiduously until they be hatched, so that she will sooner perish of hunger or otherwise, than forsake her charge.

THE FLOUNDER.

THIS is another small fish, flat and broad, with the back grey, spotted yellow, and with the belly white. This is the only known animal that has the two eyes on the same side of the head*. Another singularity is, that it swims on the side, and not on the belly, seemingly in consequence of

* Bomare places them on the upper part, which would make this class approach the uranoscopi: he says nothing either of the oblique progress of this fish.

of the position of its eyes, and of its nostrils which are also on one side. Further, these fishes have not all the two eyes situated on the same side, so that some are seen to swim on the left, and others on the right side. Some species of this fish are large, and others small. The smallest are seldom under half a foot, and one of the species is named plaise; the largest are as big as a calf, and are called holibut; some of them inhabit fresh water, and others, salt. Their flavour is tolerable.

THE STONE-FISH, OR ROCK-FISH.

THIS fish presents an assemblage of the most beautiful colours, and its muzzle lengthened out in the form of a snout, is armed with prickles. There are above twenty different species of this fish, all of a singular shape, and which have prickles sometimes at their eyes, sometimes at their lips. They are found among the rocks in India, and in America. The two following species are remarkable.

The fish with a trunk, is so named on account of a long bony trunk in shape of a bill with a small opening. It subsists upon insects, which glide on the surface of the water, and its method of catching them is by raising its trunk above the surface of the water and throwing water on the insects to make them fall, when it immediately devours them.

The fan-fish, (Plate XII, fig. 53.) is armed with three blue spines, very sharp, as well on the anterior part of the back, as on the posterior part of the belly, and its head is also furnished

with several spines. Its ventral and dorsal fins are shaped like a wing bent in the form of a sickle, which, in conjunction with the brilliant colours which they display, has probably occasioned it the name of the fan; for they are blue in the middle, and orange at the tip, in the same manner as its small tail. Its scales are of a deep green, and of a round shape. It is not larger than a large nut.

BLUBBER-LIPPED-FISH, OR, SEA PARROT.

It has obtained the first name on account of the thickness of the lips which cover its teeth; and the second from the variety of its colours, which render it the most beautiful of all European fishes. It is adorned with almost all the colours of heaven's bow, with streaks and spots, green, red, blue.

THE PERCH.

THIS is a small fish of an agreeable taste, which inhabits most of the fresh waters of Europe, swims very fast, is armed with prickly fins, and subsists almost solely on young fishes that are newly excluded. Notwithstanding, it also eats earth-worms, congealed blood, the liver and the soft parts of cattle, since it is easily caught with these baits. There are several species of the perch; the river perch, the sea-perch, &c. The perch with prickles is stuck
thick

thick with them on the back and on the belly, and resembles nearly the common perch in size and colour. There is one of the species in particular, which, by means of very long pectoral fins, has the power of raising itself from the water, and flying a little; but neither so far nor so high as the true flying fish.

THE MACKREL.

THIS well known fish has a thick, round, fat body, a mouth furnished with small teeth, very sharp, which enable it to attack with advantage fishes that are much larger than itself, and even men. People have been known to be killed by a wound of this fish. There are some species of this fish large, and others small, from one foot in length to ten, and more: some have been seen to weigh two hundred weight.

The largest species is the tunny. This fish which inhabits the North sea, travels by thousands in companies that are drawn up in as good order as a regiment. After being caught, a part is cut into pieces and salted, then put into tuns for exportation; and the remainder cut into long slices or slips, is packed into small casks to be sent to Constantinople, where it is used in the same way as pilchards are with us.

SEA-BARBELS.

THEY inhabit the Mediterranean, and do not weigh above two pounds. When stripped of
N 3 their

their scales, they are perfectly red. They are in great request in Italy, where the inhabitants have preserved the same taste for them as the ancient Romans had, who frequently purchased them for their weight of silver.

THE FLYING-FISH.

THIS fish has the pectoral fins of an extraordinary size, which enable it to use them as wings for rising out of the water, and flying in the air: nevertheless, so soon as its wings become dry, it is obliged to come down against its will, with the power however of rising again after they are moistened. But, it is not from choice or for pleasure that it sometimes leaves the watery element; but in consequence of being pursued too close by its enemies which are very numerous. In the Mediterranean sea, in the Indian seas, in those of China, of America, near the Cape of Good-Hope, several hundreds of flying-fishes are sometimes seen rising at once from the water, flying up and down for a little, and then falling back into the sea. But in endeavouring to avoid one danger they fall into another; they have enemies every where; men and birds of prey ly in wait and dart upon them as they leave the water; and on their return, they fall into the mouth of ravenous fishes which have pursued their flight, and also ly in wait for them. They are generally a foot and a half long, and half a foot broad.

But there are several species of them; the one that is represented in Plate V, fig. 40. is the sea-cock, which has the head large and armed
with

with a helmet, and three processes in form of fingers at the breast; the armed cock, which has the body shaped like a shield, and a forked muzzle; the sea-cuckoo, which, when taken imitates the song of that bird; the sea-flambeau, which has the inside of the mouth of the most beautiful red, and which, when it opens it during the night, gives a brilliant light, &c.

IV. CLASS OF FISHES.

THIS class comprehends the fishes with pectoral fins: those, to wit, which have the ventral fins, not on the thorax like those of the third class, but actually situated under the belly; such are the loche, the silurus, the salmon, the pike, the herring, the carp.

THE LOCHE.

THIS is a small well known fish which is taken in plenty during the whole spring, and which is eaten fried. It is of a dirty yellow colour, and its skin is smooth and slippery. The species named shad, which frequents marshy bottoms, and groans like the turbot, sometimes half an hour, indicates the variations of the Atmosphere equally well with the green frog, when put into a vessel of water with a little sand at bottom.

THE SILURUS.

THIS fish is the largest which inhabits the rivers of Europe ; it is generally from twelve to sixteen feet in length, and weighs from one hundred and twenty to a hundred and fifty pounds. It frequents the Danube, the Vistula, the Elbe, the Rhine, the Po, the Don, the Loire, the Garonne, &c. It eats every kind of flesh, fish, fowl, quadruped ; it is even said to attack horses that are carried to water, and not to spare even man himself. Its flesh is eaten likewise.

THE SALMON.

EVERY person is acquainted with this fish, which is eaten fresh, salted and smoked. It inhabits almost all the seas of Europe, but in the spawning season, it enters the rivers, as the Rhine, the Elbe, the Weser, &c. It is found in great plenty in one of the small rivers which fall into Brest harbour, tho' it does not frequent the harbour itself, nor even another small river parallel with the former. This fish is pretty large, and weighs sometimes so many as fifty pounds. It is cleft in two from one extremity to the other, and each half put into a wooden frame, is transported in this manner. Its flesh is tender and fat, of a reddish colour when fresh, and of a deep red when salted or smoked. The English and Dutch take the greatest number.

The salmon is likewise a migrating fish, and observes

observes great order in its progress. At the head is placed the largest and oldest, in quality of commander, followed at a small distance by two others; these again by three, then by four, next by five, each rank encreasing one, as far as the space will permit: sometimes the line is fifty deep.

In the genus of salmon are placed, the sea trout, the common trout, the red trout, the char, the grey ling.

The Sea-trout has the eyes black, surrounded with brown spots, is a constant inhabitant of the rivers, and does not exceed, at most, five pounds in weight; in other respects it nearly resembles the salmon, and its flesh, which is red, has the same taste.

The common trout has several spots, black and red, on the body, frequents clear waters with a stony bottom, particularly pools, lakes, ponds, that are surrounded with trees. Some trouts weigh so many as fifty pounds; others are so small as not to exceed the length of the hand. The trout is reckoned the best of the river-fish.

The red trout is multiplied prodigiously in the waters of Lapland, is about a foot in length, lives on gnats, and aquatick insects, has a red flesh, and furnishes together with the rein-deer, subsistence to the Swedish Laplanders.

The atherine or spurling does not exceed the length of a finger, and its lively silvery colour, which shines remarkably in the night time, makes it appear transparent. It is taken at the mouth of the rivers in France, England, Holland, Sweden, in such numbers, that it is exposed to sale in large heaps in the fish markets, where it is sold by basket-fulls.

The Gwiniad is taken in great quantity in the Northern sea, and in the lakes of Geneva and Constance. It is salted both entire, and divided into two, and packed into casks. It is also broiled and put into small casks for carriage.

The gray ling has a strong smell of thyme, and is taken upon all the coasts, and in all the rivers of Europe. It is well flavoured, and is much used as an article of food.

THE PIKE.

THIS fish is so voracious as to have acquired the name of the river wolf. It is particularly greedy of roe and young fishes; it devours fishes as large as itself: it even eats its own species. Some are so large as to weigh thirty pounds. It is found all over Europe. (Plate V. fig. 42.)

THE HERRING.

PLATE XI. fig. 4, is one of the migratory fishes, well known, and of the greatest utility. The native abode of the herrings is in the remotest seas of the North, in the midst of ice where navigators dare not approach; so that if, by a wise appointment of providence, a deficiency of nourishment did not compel them to quit these inaccessible retreats in numbers beyond reckoning, to visit almost all the coasts and seas of the world, we should be deprived of so important a resource. Thus the herrings come in armed bodies to throw themselves voluntarily into our nets,

nets, and to offer themselves to the fishers of all the European nations, who watch their progress on the coasts of Norway, of Greenland, of Iceland, of Scotland, of England, of France, of Holland, &c.

They begin about the month of May to leave their icy regions, in shoals so numerous and close, that frequently they seem to rise above the water, or to raise the surface, so that their approach is observed at a great distance.

P. But why do they keep so close? there must be room enough in the middle of the sea?

M. It is not for want of room; but it is for fear of the numerous enemies which pursue them; whales, dolphins, sea dogs, cod, and a vast number of others, in their rear, and devour them in vast numbers. Only conceive how many of them may be swallowed by such a monster as the whale! and birds of prey, who likewise follow their progress in the air, in hopes of taking their share when they rise to the surface of the water. One is almost astonished to find any of them remaining. Nevertheless they do not all perish in so long and dangerous a voyage. There still remain prodigious numbers which assemble in August and return in a body to the Northern seas, there to give birth to the generation of the succeeding year, which is equally numerous, and which never fails to perform the same journey or tour of the world.

Thus the Greenlanders, the Icelanders, the Scotch, the English, the Danes, the Norwegians, the Swedes, the Prussians, see them enter their ports, and have no occasion to go to a distance in quest of them. But the Dutch send two or three hundred ships to meet them as far as the Shetland isles, near Scotland, where they

are still good and fat, (for we must observe that the herrings become lean in this long voyage, and that the farther they travel South, they become worse in condition), and bring back when the fishery is successful, near two or three million barrels of salted herrings.

As the sale of the herring has contributed in no inconsiderable degree to the wealth of the Dutch, it may be worth while to take notice of their method of salting and barrelling them. The month of June, [the night after the feast of St. John, exactly at midnight, this is the moment when they throw their nets into the sea. As soon as the herring is caught, they open its belly, empty it, leaving only the milt and the roe, and wash it well : they next barrel it with care betwixt layers of large salt ; in this situation they send them to all parts of the world.

The herring whilst still fresh and unsalted is a delicious morsel : but as it cannot be transported in this manner, it is consumed chiefly either salted, or smoked. Thus, though this fishery was known so early as the year 1163, the herring is become much more common since 1416 when it began to be salted. It was a Dutchman named *Beukel* or *Beukelzoom*, who was the Author of this invention, as also of the method of barrelling them : and the importance of this discovery, however simple it may seem, has conferred on all the different operations in this process, and on the herring itself, the name of this fisherman. His tomb at Biervlet, in Dutch Flanders, was visited in the next century by the Emperor Charles the Fifth. This single article of commerce affords subsistence to above twenty thousand families, and formerly supported many more. Formerly the Dutch sent fifteen hundred busses

or vessels to this fishery ; at present they content themselves with the third of that number, or even less. A certain number of these busses return instantly with the herrings newly caught, and these are called post-boats.

Under the genus of herring, are ranked, the anchovy, which is a small fish of the length of ones finger at most, and the pilchard, which is a little larger. They are found in greatest plenty in the Mediterranean, and are taken in great numbers by the French fishermen in the months of May, June, and July. They are salted in pots and small barrels, which are sent over the whole world, and eaten as a relish. Some pilchards are as large and as fat as herrings.

THE CARP.

THIS is a very common fish, which is found almost every where ; it is pretty large, and there are some of them that are four feet long, and that weigh from fourteen to eighteen pounds, (Plate V, fig. 38).

Under the genus of carp are comprehended also the barbel, which has barbs on the side of its mouth ; the gudgeon which is not longer than ones finger ; the tench, which inhabits stagnant waters and weighs sometimes seven or eight pounds ; the Chenese gold-fish, which does not exceed half a foot in length, and is sometimes of the colour of red hot iron, sometimes of the most brilliant yellow gold. It is a native of China, and is kept in Europe in glass vessels or in pots, for the pleasure of looking at.

at. It lives upon bread or insects, and on small fishes.

AMPHIBIOUS ANIMALS.

THIS is a separate class which you could not have thought of yourself, but which you might have brought to my mind afterwards, when you perceived that we had said nothing of several animals that are commonly ranked among the fishes, but which really are not of that class. These are such as have likewise a heart with a single cavity or ventricle, and with a single auricle, with blood red and cold, but which breathe by means of lungs, and not of gills. Of these, some live solely in water, as lampreys: others live only on land, as lizards; others live at pleasure on land or in water, as frogs, &c. These last are properly called amphibious, that is, live in both elements. This class of animals live on flies, fishes, &c. and also on grass and plants; some of them are oviparous, and others are viviparous.

Almost all amphibious animals have something in their shape and aspect that is disgusting, and even frightful, and are particularly tenacious of life. A crocodile can live two years without food, and a serpent five. They have generally a disagreeable colour, though there are many of them too which present an agreeable mixture of the most lively colours. Their skin is smooth, dirty, cold, their voice hoarse, their eye fierce and forbidding, their gait unweildy, the members of their body catilajinous; many of them are venomous or hurtful to man; several have a bad smell,

smell, and we ought to be much on our guard against them.

Some amphibious animals change their skin yearly, as serpents; others undergo a real metamorphosis, and acquire certain parts of their body only at a certain period; for instance, frogs are at first only small tad poles, that is, small aquatick insects, which have only a ball furnished with a tail; and it is only in the course of time that they assume the shape of frogs. Amphibious animals live from two to thirty years, and even beyond that, and we make use of some of them as an article of food; for instance, tortoises, lampreys, sturgeons, saw-fishes, the thighs of frogs, and there are even some countries where serpents are eaten like eels.

Lampreys, saw-fishes, thornbacks, dog-fishes, seem to form an intermediate species between the fishes, and amphibious animals; for instead of being furnished with feet like lizards and toads, they have fins and remain constantly in the water. But we observe differences between them and fishes. These differences will serve us for dividing them into three classes: the first, the false fishes; the second, serpents; the third, reptiles*.

I. CLASS.

THE FALSE FISHES.

THEY are named thus on account of their resemblance to fishes in their fins and in their constant

* This division will appear somewhat new: it will have its advantages however.

stant abode in the water : such are the the lampreys, dog-fishes, thorn-backs, sturgeons, &c.

THE LAMPREY.

THIS false fish has the body long and slender, and inhabits all the rivers of Germany, Prussia, Poland, Russia, France, &c.; the common time for taking it, is from St. Martin to Easter. It is exported partly fresh, partly boiled and seasoned with vinegar and laurel. It seldom exceeds one foot in length and two fingers in thickness. It wants scales and has only two eyes, though it has sometimes got the name of the seventh-eye, sometimes nine-eyes, because the vulgar have mistaken for eyes the seven holes which it has in its neck, and which serve only for breathing. The lamprey has on the top of the head an orifice which serves for inspiring water, which it throws out again by these seven holes, though, perhaps this may be quite the reverse, as indeed seems more probable.

It has at the side of the mouth a great number of small teeth, with which it can attach itself very strongly to stones, wood, &c.

THE SHARK OR DOG-FISH.

THIS animal is known for the voracity with which it darts on men and other animals. Thus it is constantly observed in the wake of ships, ready

ready to swallow whatever is thrown out, men, horses, dogs or cats, calves or sheep, filth or old cloathes: its monstrous appetite rejects nothing.

This animal inhabits the Northern sea and the Mediteranean; its body is long and round, its head large, and its mouth frightful: it is viviparous. However wicked these animals may be, it has not prevented us from taking some of them, and their flesh is found to be dry and hard, their liver yeilds a great quantity of oil, and their skin makes excellent shagreen.

There are several species of sharks or dog-fishes, some as small as a calf, others as large as an ox, and even as a small whale.

The Saw-fish is one of these which inhabits the Northern seas, off Iceland, Spitzbergen, Greenland: it is from ten to fifteen feet in length, and one in diameter. Its head is armed with a saw of five or six feet in length by nearly half a foot in breadth, whose teeth are strong and sharp, and which exactly resembles a saw with two edges (Plate XI, fig. 53). This animal uses it both for an offensive and defensive weapon: it subsists on fishes and marine plants. Its most cruel enemy is the whale: they watch one another, and when this finds an opportunity, it cuts off from the whale's body a piece of fat. This, in fact, does not kill him immediately, but only after a certain period. But when several of these fishes attack a whale at once, they wound him so cruelly, that in a few hours he becomes their prey. They then rip up his belly, enter his body, and eat his tongue which is a piece of solid fat: as to his flesh, which is not to their liking, they leave it to the white bears, which seldom fail to be on the watch at a little distance.

But

But the largest and most formidable animal of this genus, is the white shark or man-eater. It is twenty or twenty four feet in length, and eight or ten feet in diameter : its mouth is so large that it can swallow a man at a single morsel : and even entire horses have been found in its stomach : The following remarkable narrative is related. In 1758, a sailor having fallen by accident into the Mediteranean, was instantly, notwithstanding his cries, swallowed by a white shark. But the animal had scarcely swallowed down its devoted victim, when the captain of the ship leveled a cannon at it, and the shot struck so straight, that the shark instantly brought up the sailor still alive, and who was taken up without having received any considerable injury. The animal which was also taken, after being completely dispatched, was hung up on the vessel : it was twenty feet in length, by about eight in thickness, and weighed three thousand two hundred and twenty four pounds. The captain gave it to the sailor, who showed it for money, and went about the country with this monster*.

As it frequents the Mediterranean, it is not improbable this was the fish that swallowed the prophet Jonas. If there be any person rather of opinion that this was a cachalot, of the genus of whales? we have no objections. We shall speak of it by and by, when treating of the whale. It is at least certain that this animal has got the name of Jona's fish. Its mouth is furnished with six rows of moveable and triangular teeth, which it raises and erects at pleasure, when about to devour its prey. These are the teeth that are found petrified

* This anecdote is mentioned in the German Translation of Linneus, by Professor Muller; part 3d.

petrified in the island of Malta, and in some other places.

THE RAY.

THIS fish is flat and almost round; it frequents the Northern sea and the Mediterranean, where it is taken in great numbers; it is excellent food. It has five holes in the neck for breathing, and its mouth is below, at the under part of its head. Some rays are not larger than the hand; others are five or six feet long, and weigh two hundred pounds; some have even been seen twice this size.

The eggs of the ray have a blackish shell furnished with four long points at the corners, and have some resemblance to rats, so that they have in reality sometimes been called sea rats.

The torpedo is a species of this genus, and is one of the most remarkable of them, on account of that electric power, by which it benumbs and repels every thing that approaches it. This shock is even felt when the animal is touched out of the water; it is felt through the whole body.

THE STURGEON.

THIS animal is from four to twenty feet in length, by six or eight in breadth, and weighs frequently above twelve hundred weight. It inhabits the Northern sea and the Baltick, the Danube, the Elbe, the Vistula, and the Volga; some are caught in the Loire in France, which are
three

three ells in length : their flesh is eaten, and even the eggs of some, as of the sterlet and the huso. The eggs are the size of lentils ; they are washed and pickled with salt, pepper and onions. This kind of composition is sold under the name of caviar, which is of a greenish colour, and is eaten upon bread like butter ; it sharpens the appetite and fortifies the stomach.

Beside this use which is made of the eggs of the huso, the animal is likewise remarkable in this, that its skin, its tail, its fins, entrails, bladder, serve for making fish-glue, so useful for cementing wood, or other things. This has procured to this fish the name of *ichthyocola*. All these different parts of the animal are cut into small pieces : they are then boiled to a jelly, and this jelly is spread out into thin leaves. They are the Russians who make the most of this glue, and the best.

THE OSTRACEON.

THIS is another false fish which has the skin very hard and coriaceous, having in each jaw ten teeth that are round and obtuse, and holes for breathing that are long. There are nine species of this genus, which are all inhabitants of the Indian seas, and which have gotten names analogous to their different shapes : that represented in Plate XII, fig. 47, is the four horned.

THE

THE SEA HEDGE-HOG.

It is named thus because it has the whole body set with moveable prickles like the land hedgehog. It has, instead of teeth, two jaws, in the shape of pads or cushions, which are cartilaginous, or rather osseous: they are very hard, and have the same effect as two small mill-stones. It is found at the cape of Good-Hope, and in North America. There are two species of it, the sea porcupine which is of an oval figure (Plate XII, fig. 51), and the fish-ball, which is nearly quite round, and of the size of a large foot-ball (Plate XII, fig. 48.)

THE HORNED FISH.

It has the head flat, eight teeth in each jaw, and above the pectoral fins, long holes for breathing, situate in an open line or gutter. Its skin which is like parchment, is covered with scales. There are eight species of it which all derive their names from their horny excrescences, and and which inhabit the ocean between Africa and America. One of the most remarkable is the wrinkled nose, which contracts its nose and upper lip, so as to show the whole jaw bare from above. This is shining, and in the shape of a horn, (Plate XII, fig. 50).

THE

THE NEEDLE-FISH.

THIS is a small aquatick animal, long and slender, which frequents the North sea, the Baltick, the Mediterranean : most of the species of this fish are viviparous, and are but bad food. The species named sea-needle, is a foot long or at most a foot and a half, and is not thicker than ones finger.

The hippocampus is a pretty small animal, the length of a finger, which, though strait while alive, bends and twists itself when out of the water, and a-dying : its name comes from this, that in the attitude which its head assumes, it resembles the head of a horse.

This small animal and the preceding are found in all cabinets of natural history.

II. CLASS.

SERPENTS.

ALL the genera contained in this class are no great favourites with man, and it may even be said that they are but little friendly to him : many of them are venomous and dangerous to him.

Serpents have neither feet, nor other members ; their manner of going is by crawling or gliding on their belly, and they perform rapid motions on the ground by bending and wreathing their body. They even ascend trees, and though they cannot continue long in water, they

can

can yet remain a while in it likewise. But their common abode is in moist fresh places, as under heaps of dung, of dead leaves, in holes in the earth; there it is that they deposit their eggs fastened one to another, or where they bring forth their young, such of them as are viviparous.

Their body is covered with scales, or with rings, or with scaly belts. They have delicate ears, a tongue narrow and cloven, and teeth, which, in reality, do not serve for chewing their prey, since they always swallow it entire, but only for holding it fast when they have seized it. Grass, flies, beetles, spiders, lizards, birds, rats, frogs, toads, cats, hares, according to the size of the serpent, all are taken down whole into the stomach, even stags are not exempted from this.

P. And the horns likewise.

M. No. But what is remarkable, is that not being able to cut the wood of the stag, they are compelled, in this case, to let it project from the mouth till it fall off of itself, and its root putrefies and loosens: this commonly happens in the course of some days.

P. But how can serpents swallow animals that are larger than themselves?

M. Some serpents are very large; from ten to twenty feet in length, and as thick as a man. But it is true they can stretch and widen to an amazing degree their mouth and belly. These animals live ten or twenty years, change their skin every year, and grow as long as they live. They have no bones, but only simple cartilages. When sleeping, they are rolled up in a spiral, and commonly keep the head elevated: in Europe, they sleep during winter, at least during the greatest part.

One

One thing will surprise you, which is, that of all serpents there is not above a hundredth part that are venomous. In Europe we reckon but a small number that have that bad quality; in Germany, and to the northwards, there are none that are venomous. The warmer the climate, the more dangerous the animals that inhabit it, both on account of their madness, and their venom. Thus when in Germany, one runs away at the sight of a serpent, or when struck with terror as soon as he perceives this poor animal, a person can only cry to an assistant for help; this arises from pure ignorance; it is for want of informing ones self, or of being instructed.

P. Oh! as to myself, I am terrified for serpents; are they not hurtful then?

M. Neither hurtful, nor venomous: they never bite, nor even attack any person, nor do they spit venom either on man or beasts.

P. But is that possible, dear Sir?

Stay, if we light upon one some day, I will show you that it may be taken up without fear: we shall afterwards keep it and feed it, and you will certainly find pleasure in contemplating the beautiful robe of this species of animal, which is of itself a hundred times prettier than some animals to which we give the preference. What is more, perhaps I shall take a fancy some fine morning to have it roasted like a pigeon, and to eat it to my breakfast.

P. Ah, mercy! dear Sir, do not that! for you will surely die

M. I am much obliged to you for the anxiety you express for my safety; but if I must die for eating a bush-eel, I should certainly have seen a number of good people in Provence killed,

ed, who are yet in good health, and who eat these animals whenever they have a mind.

P. How ! bush-eels !

M. Yes, that is the name given them in those provinces of the kingdom where people are in the habit of eating them. If we make a journey together some day to those parts of the country, I will give orders, on purpose, at the first inn we stop at, to make ready an eel.

P. Well, we shall get an eel, and not a serpent ; then I shall join you with pleasure.

M. What will you hold, that we shall be asked whether we wish a bush-eel, or a river-eel ? And then I shall say, a bush-eel ; and I am certain that when you shall feel its agreeable flavour, and see it well dressed, you will have as great a liking to it as myself.

P. But, have you already eaten some of them, dear Sir ? sincerely ?

M. Come, look at me well ! have not I the appearance of one that is dead ? I might long ere now have been interred, for I have long ago regaled myself on fine serpents, fat and plump. Besides, I could mention to you many other countries where it is customary to eat these animals, and others which we do not taste in this country. For instance, in Jamaica, which is an American island, serpents, lizards, rats, are carried to market ; they are eaten by every body ; they are presented at the best tables, and every body likes them *. Nevertheless, there are many more poisonous serpents in that country than in Europe : and it is the same in Africa, where we find the viper, the serpent with spectacles,

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O

tacles,

* See Sloane, Introduction to the Natural History of Jamaica.

tacles, the serpent with bells, &c. But as to the giant-serpent, the blind serpent, &c. neither of these are dangerous. It is even astonishing that we have not thought it advisable to tame some species of them in our houses, where they would be of great use and convenience.

P. And how that?

M. Serpents are great enemies to rats and every insect: thus they would free us of these better than cats. Besides, they are of a more agreeable shape than cats; they are not so wicked; they are cleanly; they are familiar and sensible of the attentions of man: these would be charming animals, if we had once the courage to accustom ourselves to them.

P. It is true that would be very pretty; a fine marbled serpent which was tame, and which did no hurt: I think I could easily accustom myself to it.

M. We shall see: But in the mean time we must learn to distinguish those which are dangerous, and with which it would not be safe to grow familiar.

For that purpose let us begin with the serpent with bells.

THE SERPENT WITH BELLS, OR RATTLESNAKE.

P. But has it in reality, bells?

M. We ought rather to say the serpent with castanets, as its Greek name signifies; for what occasions the noise in this serpent, is actually something of that kind. This serpent is an inhabitant of Africa and America; it is from four to six feet in length; it is three or four fingers thick,

thick, and sometimes as thick as the arm. It carries on its tail twenty or thirty shells in a circle, which rise one over the other like those in the tail of a lobster, but which are hard like horn and hollow, so that as soon as this serpent begins to move, these rings make a noise nearly similar to that of castanets, or to that of a dry bladder into which some stones have been put. (Plate X, fig. 15.) This noise is heard at a considerable distance; and it is an admirable precaution of Providence, who, in conferring on this dangerous animal a noisy pace, has obliged it, so to speak, to give warning of its approach to men and cattle, on whom it darts with fury, if they have not taken their measures. One may wait, however, till it come within the distance of eight paces, since it can neither run fast nor long. But if a person has the misfortune to be surprised and bitten by it, he has but a few moments to live, unless he instantly suck the wound, or apply to it some certain remedy, or where circumstances admit, take off the member that has received the wound*.

Nevertheless, we must do it justice; this animal never falls upon men or beasts, unless compelled by hunger, or provoked by some injury: it has been seen to pass over the belly of people who were asleep, without doing them the least injury.

O 2

P.

* In those countries inhabited by this dangerous serpent, there are every where found plants or herbs, which, it is said, are specific, and the only remedy against its bite: to wit, the seneka, (*polygala senega*), and the *Serpentaria* (*ophioriza mungos*.) The Indians never travel without this antidote. The Negroes apply to the bite, a powder probably composed of these herbs, and afterwards fire. The Volatile Alkali given in a proper vehicle, is a certain and proven antidote.

P. Well ! and it should pass again : for my part, I should take good care not to injure it, if I was in that country ; on the contrary, I would always carry it something to eat.

M. In that way, you would be sure to make it your friend.

P. But is it quite certain people die so suddenly of that ?

M. Yes indeed, when bitten ; then the venom of serpents is mortal, especially that of this serpent. But otherwise, you might drink a glassful without receiving the smallest hurt.

P. Fy ! it hurts me already, the very mentioning it.

M. It is, however, very certain, and known to all the world. Nor is it at all surprising, that a fluid should not hurt us, whilst it only comes in contact with our skin internal or external, as that of the mouth or stomach, whilst yet it shall be mortal, if it enter the blood by any opening or puncture in the skin, such as is made by the tooth of a serpent.

This serpent carries its poison in two small bladders, situate at the base of two moveable teeth, hollow and sharp : and as it makes the puncture, it at the same time infuses, through the hollow of the tooth, as much poison into the wound, as kills the animal in a few minutes.

There is in the aspect and appearance of this serpent, something terrible and hideous. Nevertheless it is one of those which have the singular faculty of enchanting, somehow, by their meek look, birds, squirrels, rats, even cats.

P. But how does it catch them, since it can neither run nor fly !

M:

M. Just by that inconceivable enchantment. It does nothing more than stretch itself on the ground, or along the trunk of a tree, play with its bells, keeping the head erect, the mouth open, and looking stedfastly, without stirring, on the poor animal it wishes to seize. By and by, the poor bird or squirrel, that is on the tree, the rat or cat that is on the ground, instead of running away, or flying, begins to tremble and groan, wishes to fly and has not the power, but leaps from branch to branch, always coming nearer the terrible enchanter, and at the last leap throws itself voluntarily into his open mouth, whence you may easily imagine it never returns. But it is said, if the serpent ceases to look at his prey, the poor animal runs or flies away, and gets out of danger.

As to that, I have not seen it, it is true ; but those who have been in the country, have affirmed and related that this was the case ; some Europeans even, who have made experiments on the subject to satisfy themselves.

VIPERS.

This species of venomous serpent, it is said, has a wonderful power of enchantment. Mice, it is pretended, that were quite brisk and active about their food, whilst they did not suspect a viper near, have been seen, the instant they perceived one, to lose their appetite, their liveliness, become uneasy, run round it for a few moments, and then enter its throat.

This serpent, which is one of the amphibious,

ous, or water serpents, is very frequent in Egypt, and is viviparous.

The viper with rings, or serpent with a collar, is not venomous: it frequents stables, and deposits its eggs in holes among dung, eats grass and herbs, and destroys rats, mice, insects; so that it is rather useful than hurtful. It is named serpent with a collar, because it has on each side of the neck a white spot which has the look of a collar.

The European viper is of a brown grey, with a black line on the back. It subsists on lizards, scorpions, frogs, toads, moles, rats, beetles, and small insects. It is very tenacious of life, and can live two years without food; but it is not venomous.

The horned serpent is an inhabitant of Egypt, and has, above its eyes, two small excrescences, which have the appearance of horns, and have occasioned it this name. But real horned serpents are no where to be found, or if they have been seen, it was probably a trick; that is, the spurs of a cock had been planted in their head, as was done formerly by the Arabs, and had taken root; cocks have sometimes been rendered horned by the same method.

THE SERPENT WITH SPECTACLES

THIS serpent is sixteen or eighteen feet long, and as thick as ones leg, or thigh. It is very venomous, and is an inhabitant of India: its name is derived from a spot in the form of spectacles, which it has on its back or head.

THE

THE ROYAL SERPENT.

It is also called the giant-serpent on account of its size; the god-serpent, because the Indians revere and pay a sort of homage to it; and *boa*, in the language of the country. It is said that it will swallow a hind entire, and even the strongest lion, an ox or a tiger; so that it is the largest of all serpents, but is not venomous. In length, it is from twenty to thirty feet, and it is as thick as a man, or even thicker. As it destroys locusts, toads, lizards, and smaller serpents, some of the Indians have a great veneration for it, and consider the murder of a *boa* as a crime deserving the severest punishment. But some of the other Indian tribes are not so scrupulous, and kill as many as they can for the purpose of eating them, and selling the skin, which is very beautiful. See Plate XII. fig. 45.

THE BLIND SERPENT.

It has a quick enough sight, but its eyes are so small as to be perceived with difficulty. It splits into pieces if tormented never so little; it inhabits most of the countries of Europe, and is not venomous.

THE THIRD CLASS.

REPTILES.

THE animals named reptiles are those which have four short feet, which they scarcely make use of to assist them in their progress, and which have the skin smooth, or covered with scales like serpents; such as lizards, both the flying and common species, crocodiles, frogs, toads, and tortoises.

FLYING LIZARDS.

THEY are sometimes named flying dragons, and flying serpents; but there are no more flying serpents, than serpents naturally horned, or serpents with two heads, though one species of them has the tail large and swelled, instead of being pointed, and goes backwards and forwards at pleasure. Flying dragons are only lizards with a kind of wings, somewhat like bats; by means of which they can leap cleverly from one tree to another, and from the ground upon trees, but not fly with the freedom of birds, or move about in the air like them. This, however, has been sufficient to procure them the name of flying lizards, (Plate XI, fig. 1.) They inhabit Africa and the Indies, do not exceed the length of one's finger, resemble almost in every respect common lizards, and live on flies and other small insects. Formerly, people were silly enough to believe that

that there were certain hideous animals whose body resembled that of lizards, with the tail of a serpent, a large head, a wide mouth, two feet, and two wings with which they flew at large. They made them from twenty to forty feet long, and sometimes with seven heads supported on seven long necks. It was further said, that they were cruel and terrible animals.

LIZARDS.

THEY have a long naked body, four feet, with claws, and a long tail very sharp, just like crocodiles, which resemble them almost completely, and which have been classed for that reason in the same family. Lizards run very fast, are about the thickness of ones finger, and the largest are not above three feet long. They haunt moist dark places where there are many flies and gnats. Several inhabit the water, and subsist on the eggs of fishes, also on small fishes, and water-lentils, (Plate XI, fig. 7.)

This innocent animal is found in almost every country: it has no venom, does hurt to nothing, and renders every where an important service, by destroying myriads of insects that are troublesome and hurtful. It would be an excellent practice to entice them into, and nourish them in gardens, for they are to flies, what the cat is to a rat. There are many places where they are eaten, as likewise their eggs; those of the small species, are as large as peas, and those of the large, as pigeons eggs. What is somewhat remarkable in them, their tail grows again when it has been cut. Some are brown, green, marbled,

of every sort of colour and agreeable mixture. Some of them have six toes on their feet, others four, and there are likewise some which have four on those before, and five on those behind. These toes are in some species tied together by a membrane like those of ducks; in others, they are fastened together two by two, or three by three.

The green lizard, named the leaper, has the back green, and black and green spots upon the sides, the belly yellowish, and five toes very sharp. It is the most beautiful of our lizards; it frequents dry places, mountains, walls, and sometimes gardens, or their neighbourhood. When surprised, it looks stedfastly, and opens its mouth; but when we wish to catch it, it makes a leap, and escapes: thence comes its name. It is at most the length of the hand, and may be preserved long alive in bottles with a little wet moss and earth, provided we take care to give it now and then a fly, gnat, or other insect.

There is in Egypt a species of lizard called guardian or sentinel, because it keeps near the crocodile, and gives a sort of whistle when it sees men approach too near this place. It is three feet in length, and half a foot broad; and when it finds itself too near a crocodile, the fear of being devoured, makes it send forth very sharp and piercing cries.

The lizard named cameleon, (Plate XI, fig. 26.) inhabits principally the East Indies, the south of Africa, and Spain, where it gets upon trees, and eats a great number of flies and other small insects, which it easily seizes with the assistance of its tongue, which is immoderately long. As it has the power of inflating itself greatly,

greatly, and then contracting itself, it was believed formerly, that this animal eat nothing, lived on air, and that this was its manner of taking its aerial repast.

It is about the length of the hand, and its ordinary colour is a bluish gray; but if irritated, it changes frequently its colour; it becomes yellow, gray, black. Another peculiarity is, that its eyes are of a beautiful golden yellow, and that it can look two ways at once, forwards with one eye, and backwards with the other.

The guecco is an inhabitant of the Indies, of Egypt, and of Lower Italy; and has its name from this, that when about to rain, it repeats several times successively a cry, which sounds like these two syllables. It is half a foot long, and is said to be venomous, because in passing over fruits and plants, it is imagined that its paws leave a humour on them, that proves hurtful to those who eat them, without having previously washed them well: they experience the severest pains of the colick.

The basilisk (Plate XII, fig. 1.) is not quite a foot long; it is of a bluish gray, sprinkled with white spots; it carries on the nape of the neck a membranous crest, which it can expand like wings, and which enables it to fly a little. It is an inhabitant of Egypt, and dwells on trees. It too is one of those reptiles, of which the most ridiculous fables were at one time generally believed: take, for instance, the account that has been given of this! but you could not guess it; it is this. "In that period, says one, cocks laid eggs, (at present, you know that they no more lay eggs, than oxen bring forth calves); and the animals produced from these eggs, were small basilisks which had the power of making

every animal that looked on them fall down dead; even men, who had that misfortune". You see that we fortunately live at a period when it is not the fashion for cocks to lay eggs; the eggs of hens are not so unlucky. But I forgot one material circumstance, which was, it behoved these cock-eggs to be hatched in dung, probably because the cocks would not take the trouble of sitting, like hens.

The *Legouane*, or *fenembi*, is one of the largest of the lizards, since it is nearly four feet long, and a palm in diameter. It is found in America upon trees, where the Indians take it with nets, and eat it as a delicacy. It bites readily, scratches, strikes with its tail, fixes upon clothes when taken, especially at the time of its amours; but it allows itself to be approached without fear.

The salamander is likewise a lizard of which a singular enough story has been propagated, which the vulgar perhaps still believe; namely, that it can live in fire as long as we choose. See Plate XI, fig. 6. This reptile is a span long, and scarcely as thick as the finger; its back is black and shining, and its belly yellow. The back is furnished with two rows of nipples, from which it discharges a whitish fluid that extinguishes the coals about it. But if it be thrown into too fierce a fire, its nipples signify nothing, it is burnt: otherwise it escapes sound and safe by means of its pumps, and returns to the pursuit of flies on which it subsists. The salamander is viviparous*.

THE

* Bomare says, after some other authors, that the aquatic salamander is oviparous.

THE CROCODILE.

THIS lizard so formidable to men and cattle, inhabits the rivers and lakes of the south of Asia, and of Africa; those of the Nile in Egypt, are famous from the remotest antiquity. It is truly an amphibious animal, and lives equally in water and on land. Its aspect is horrible, (Plate XI, fig. 40.) It is twenty-four feet in length, and above two thick at the breast: but its hinder part contracts, and grows to a point. Its forefeet have five toes, and those behind, four, united by a membrane; and three of each foot are armed with nails very long and very sharp. Its back is black, brown, or grayish, and the belly whitish. It deposits annually upon the sand of the Nile a hundred eggs, which are hatched by the heat of the sun, and which are as large as goose eggs. Grass, fishes, serpents, lizards, sheep, oxen, even men when it can catch them, every thing suits its taste. It couches in the mud, or among bulrushes, and remains there for whole days, without motion, watching people who come to bath, or are impudent enough to fall asleep on the brink of the river. They frequently see it without suspecting it; and they take it for some old stump, or something similar. As soon as it sees a man, it creeps silently to get near him; and when it gets within reach, it darts upon him with a bound, strangles and devours him. But if it cannot find means to come at him, it tries to reach him with its long tail to throw him on the ground. This frightful reptile has even been seen carry off a man out
of

of a canoe, and devour him in sight of his companions, without their being able to bring him any relief. Its tail is so strong, that it can overturn the strongest bull with it, and kill him.

An animal so ravenous, which lives from forty to fifty years, and which every year lays a hundred eggs, would soon multiply sufficiently to destroy the human race, if all its eggs proved productive. But happily, the people of those countries make a diligent search for the purpose of destroying them ; on the other hand, it has for its enemy a quadruped, the ichneumon, which is very fond of these eggs, and which knows well to find them. In short, crocodiles destroy one another.

It has been pretended that the ichneumon, taking the opportunity when the crocodile is asleep with his mouth open, enters into his body, eats his liver and lungs, and then makes itself an opening through his belly : but this is found to be a fable. If the ichneumon was a reptile, we would treat of it here : but it will come in its place.

FROGS.

Do you know the song koa, koa, koa, with the burden ouhe, ouhe, ouhe ? and the singer ?

P. And the couplet koa, koa, ker, ke, ke, which you forgot ?

M. I well knew you was acquainted with the whole : you must have long been acquainted with frogs and their companions the toads, that are so well heard at even in every corner where there is either little or much water. The frogs which dwell

dwelling chiefly on *a* and on *e*, are the green aquatick frogs of ponds, with a yellow stripe on the back. Those which only croak, are brownish, and frequent pools and rivers. As to land-frogs, they haunt trees and bushes.

P. Like birds ! and what do they, there, where we have never observed any of them ? Do they eat leaves or fruit ?

M. We see almost every day things which we had not seen before. Frogs do the same on trees as in water, they pursue flies and other small insects that haunt ponds, trees, bushes. Nevertheless, water is their element ; there, they are produced from eggs, and there, they pass their tadpole state. But as soon as they become frogs, and furnished with four feet, they, quit the water, and go to spend their lives on trees, and on land. Thus there are none of these amphibious reptiles, frogs or toads, that live always on land ; they always return to the water at certain times ; and especially if they see an enemy approach, they dart into it in an instant.

Frogs and toads are oviparous ; the latter lay every year above a thousand eggs, and the former about eight hundred, though all the species be not equally prolific. At the end of eight days, there are produced from the eggs, small animals with large heads, a tail, without body, and without feet, rapped up in a mucilagenous matter, white and transparent ; these frisk about in the water with great vivacity, and feed on the mud attached to aquatick plants. After six or seven weeks, these tadpoles get legs, first the hind legs, and then the fore ones ; and after both are developped, the frogs by degrees lose their tails, and begin to travel on land in quest of flies, snails, &c.

One

One can scarcely take an evening walk, without seeing these young frogs and little toads leaping on every side: and the good women say they are fallen from heaven with the rain. During the whole of the first year, they are scarcely so large as a big bean; and it is not till the third year that they acquire their full growth, and then they begin to croak as well as to spawn. They afterwards live in this condition for eight, ten, twelve years.

In autumn, and in the begining of winter, the frogs and toads return to the water, dig themselves holes in the mud, where they place themselves by two, four, eight, and even more together, always in even numbers. They continue there without food till the spring; and though they do not escape the frost, they are not killed by it. But as soon as spring quickens a little the benumbed year, and the ice begins to dissolve, and the showers to form pools and puddles, the whole croaking brood waken at once, and proclaim to the world the news of their resurrection, by reiterated koa's, koa's, bouo's bouo's.

Some toads also lie concealed during winter among stones, and in old walls.

During the day, the frog willingly continues to croak in the water, but at even it and the toad leave the water, and make for the fields. However, they also leave it during the day, especially after a warm shower, and we find them in knots here and there; but they have neither descended with the shower from heaven, nor been produced from the mud.

The frogs having neither venom nor malice, freeing us of many flies and snails, and even furnishing us with a kind of aliment, may be regarded

ed as usefull animals. We eat only the thighs, but ravens, swans, serpents, ducks, devour them entire, skin and hair. Formerly the spawn of frogs was employed in the composition of a plaster.

The frog is very tenacious of life ; it can live ten or twenty days without food ; and after its four feet have been cut off, and its entrails taken out, it continues to live for some hours, frequently for some days. Frogs have the head longer than toads, they are contracted towards the chest, and have the hind-legs slender : toads, on the contrary, are nearly every where of an equal thickness, and have the legs strong. Frogs, in general, are more lively than toads ; they sit on their hinder part like a dog, whilst the toad always keeps its belly on the ground.

Frogs are found in every quarter of the world ; but there are three species that are most frequent in Europe : these are the land-frogs, the aquatick frogs, and the tree-frogs.

The land, or meadow frog, has the back brown and flat : the belly of the male is of a whitish gray ; and that of the female of a reddish yellow, marked with brown spots. The fore-feet have four toes distinct ; and those behind, have five tied together by a membrane. This frog lives on land during summer, and in water during winter : it subsists on flies, snails, and other insects. After rain, this species of frog comes forth in great numbers from the bushes, and thence comes the ridiculous opinion which people have, that it rained frogs. It is not customary to eat this frog.

Aquatick frogs seldom leave the water, and commonly live in ponds, pools, puddles, &c. Their back is green, streaked with yellow, and their

their belly white: they are larger than the former species, and likewise subsist on small insects. The thighs of this species are eaten. Figures 4.---11. of Plate XII, represent an aquatic frog with its metamorphosis.

The tree-frogs live on trees beneath the leaves; they have the skin smooth, broad before, narrow behind, the eyes black and brilliant, the back of a grass-green, and the belly white. They are very active in water, and croak when it is about to rain; thus one may make a barometer of them, by keeping them in the window in a glass vessel filled with water, where they must be fed with flies: one may thus prognosticate all the changes of the weather. These frogs are easily taken, whilst the others which have a quicker sight and a finer ear, escape on the smallest noise into the water. This species is not eaten.

TOADS.

THESE animals are not of an agreeable figure. They have the head small*, the body large and thick, and the legs unwieldy: they are indolent animals, and always crawl upon the belly. They copulate in water like frogs, and continue several days in copulation.

There are several species of toads: with us we have particularly the common toad, and the igneous toad.

The common toad (Plate XII, fig. 12.) haunts old buildings, places that are moist and dark, and likewise

* Bomare says, the head is rather large: nothing is more easy to be ascertained.

likewise sometimes caves. Its body is large, the belly prominent, the skin rough, the colour green, brown, spotted with yellow and black. It has five toes on the hinder feet tied together by a membrane, those before are very short, and only four in number : it moves heavily : it subsists on flies, snails, all kinds of worms, as also herbs, sallet, and its cry is ouo, ouo ; so that when several voices join in concert, one would take them for dogs howling. During the day, it keeps in its dark retreat ; and it is only at night that it comes out in quest of flies and snails. When frightened, it throws out a fluid, which, though not venomous, is, however, hurtful, and has a remarkably foetid smell, which is scarcely dissipated at the end of some weeks.

The igneous toad derives its name from some spots of fiery red which it has on the belly : it is much smaller than the former species, and is seen chiefly after rain. Its cry is ounk, ounk.

There is at Surinam, a toad of the name of *pipal*, (Plate XII, fig. 3), which is a palm in length, the skin of a blackish brown on the back, and of a yellow gray under the belly, in other respects like other toads. It carries its young on its back, till such time as they are in a condition to shift for themselves : the female is in the habit of equipping herself with her spawn, so that the eggs are attached to her back, which is full of rinkles. She afterwards carries them till they be hatched, and till the young toads get feet, which in general requires an interval of twelve weeks.

Toads live twelve or fifteen years ; some even live so many as fifty, and above it. Toads have been found alive inclosed in the middle of a stone. Sometimes frogs and toads increase to such a
pitch

pitch as to eat up all the grass, and become a plague like the rats.

THE TORTOISE.

THIS very useful reptile will conclude our class of amphibious animals: it pertakes of the shape of the lizard, and of the frog, but is of a singular structure in this respect, that its body is inclosed in a kind of case of very strong shell, which forms part of it; and from under which it can only protrude the head, the tail, and the feet. Tortoises are found in many countries, but the largest are found in the warm climates of Asia, Africa, and America.

Tortoises are oviparous: they lay annually eighty or ninety eggs, which they leave on the sand, without troubling themselves what is to become of them. These eggs are about the size of those of a goose, or thereabout, in the large species, and of walnuts or hazelnuts, in the small species. At the end of six weeks, the female returns to the place where she had deposited her eggs, which she finds hatched by the heat of the sun, and then she conducts her whole family to the sea, where she teaches them to seek their food; unless she be a land tortoise, and then she remains at land with them, and takes the same care of them: for there are both land-tortoises and water-tortoises.

The water-tortoises remain almost constantly in water: they have feet like those of a goose, which prevents their running, and makes them creep slowly. They live upon small fishes, lob-
sters,

sters, worms, and other small aquatick animals.

Land-tortoises have the toes separate and loose; they seldom frequent the water, and eat grass and plants.

Tortoises in general grow slowly: in the space of twelve years, the small ones scarcely grow a finger's breadth, and the large ones a hand-breadth. They live eighty or ninety years, during all which period they continue to grow. They are very tenacious of life; after the head is cut off and the belly opened, they will continue to live several days, frequently even two or three weeks; they can also live a whole year without food.

Some tortoises are not larger than the hand, others are as large as an ox, and weigh two, three, six, eight hundred pounds, and have a shell as large as a room door.

P. And do these large ones no hurt?

M. Tortoises do hurt! they are the most peaceable and innocent of animals; and are of much use. We eat their flesh, which is green and fat, and has the taste of a pullet: sailors are very fond of it in their voyages. Their shells serve for making a number of pretty utensils. Formerly the Indians used the largest in place of shields, or for canoes.

P. But how are these large animals taken?

M. The tortoise is likewise easily caught: You have only to watch the moment when he leaves the sea in the evening, come behind him with a pole in your hand, and throw him on his back with it: he is taken. But if you come in front of him, he throws a quantity of sand in your face; and if he can lay hold of his man, he crushes him.

The

The one that is called midas, or giant, and which is represented in Plate XI. fig. 8. is the largest of all.

Its shell is the size of a chamber-door, and its weight from seven to eight hundred pounds; with ten men on its back it walks as if it carried nothing, and the heaviest cart may pass over it without breaking it, or even so much as making it to bend.

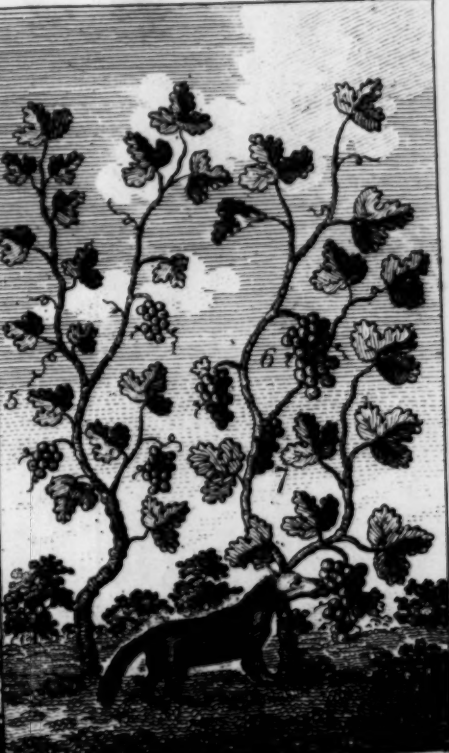
The geometrical tortoise is one of the smallest; it is not larger than the hand, and has a beautiful shell spotted with black and yellow.

Lastly, the species named scaly tortoise has the most beautiful and the best shell of all; and its name is derived from its scales, which are a palm in breadth, and are placed one over another, like those of fishes.

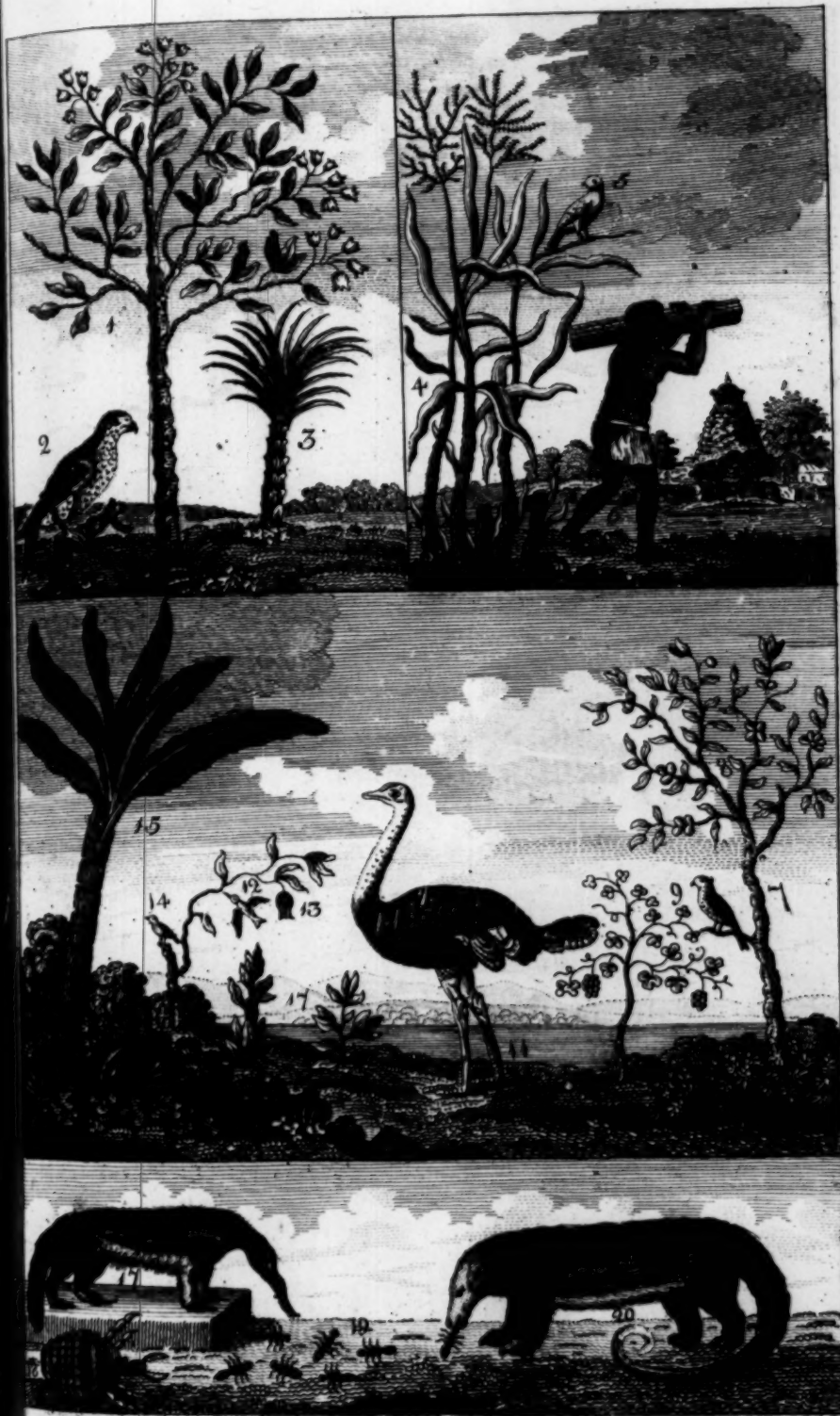
Land-tortoises, which are smaller than the others, and to which it would seem, those called fresh-water-tortoises, ought to be joined, since they cannot live constantly in water, are likewise found in France about Marseilles and Bourdeaux.

END OF THE FIRST VOLUME.





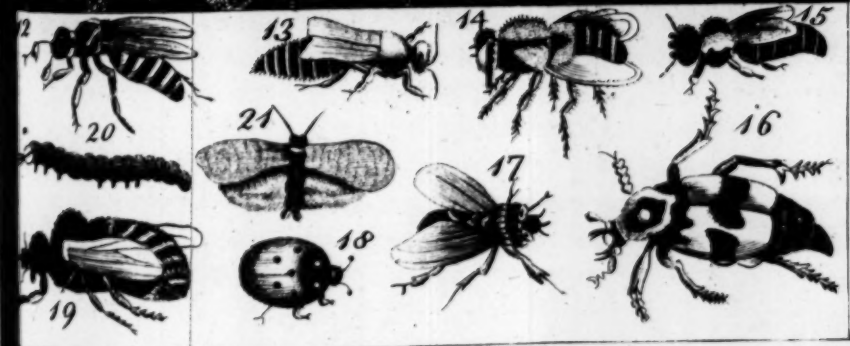
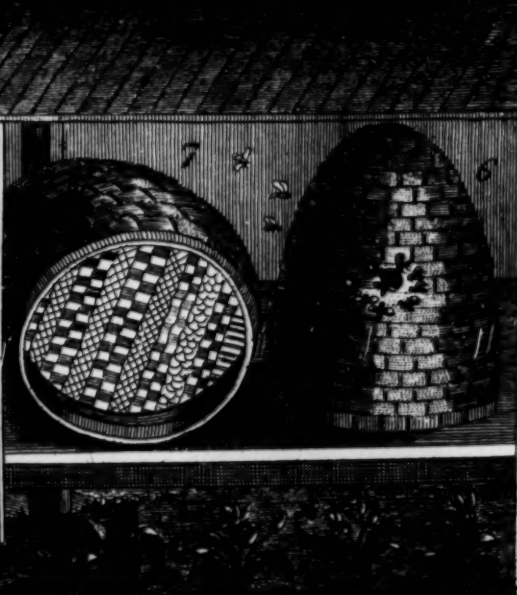




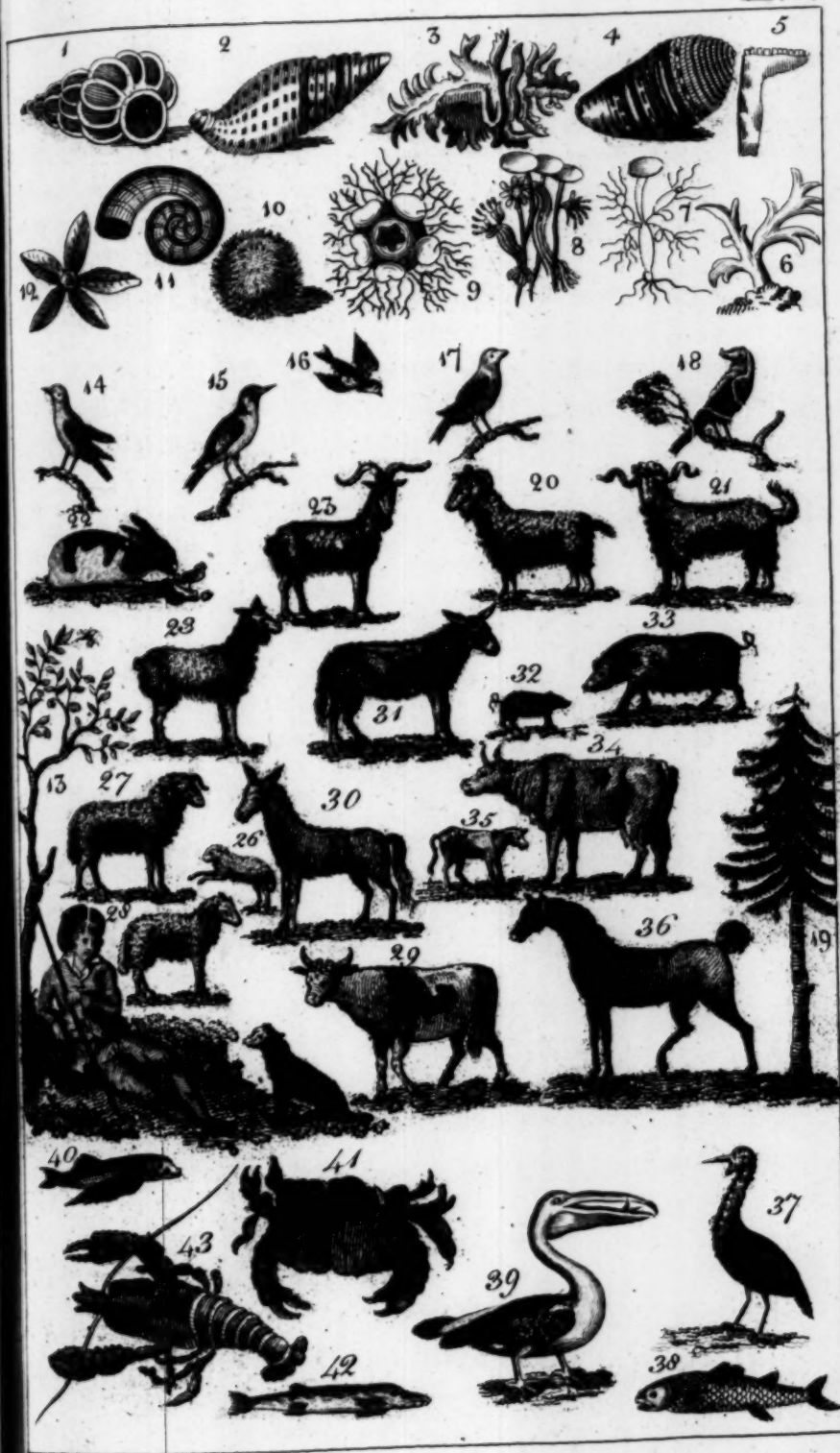






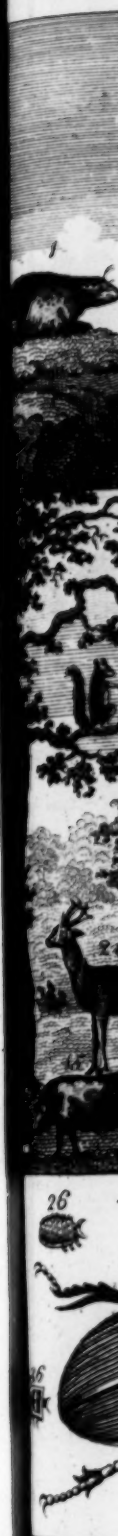


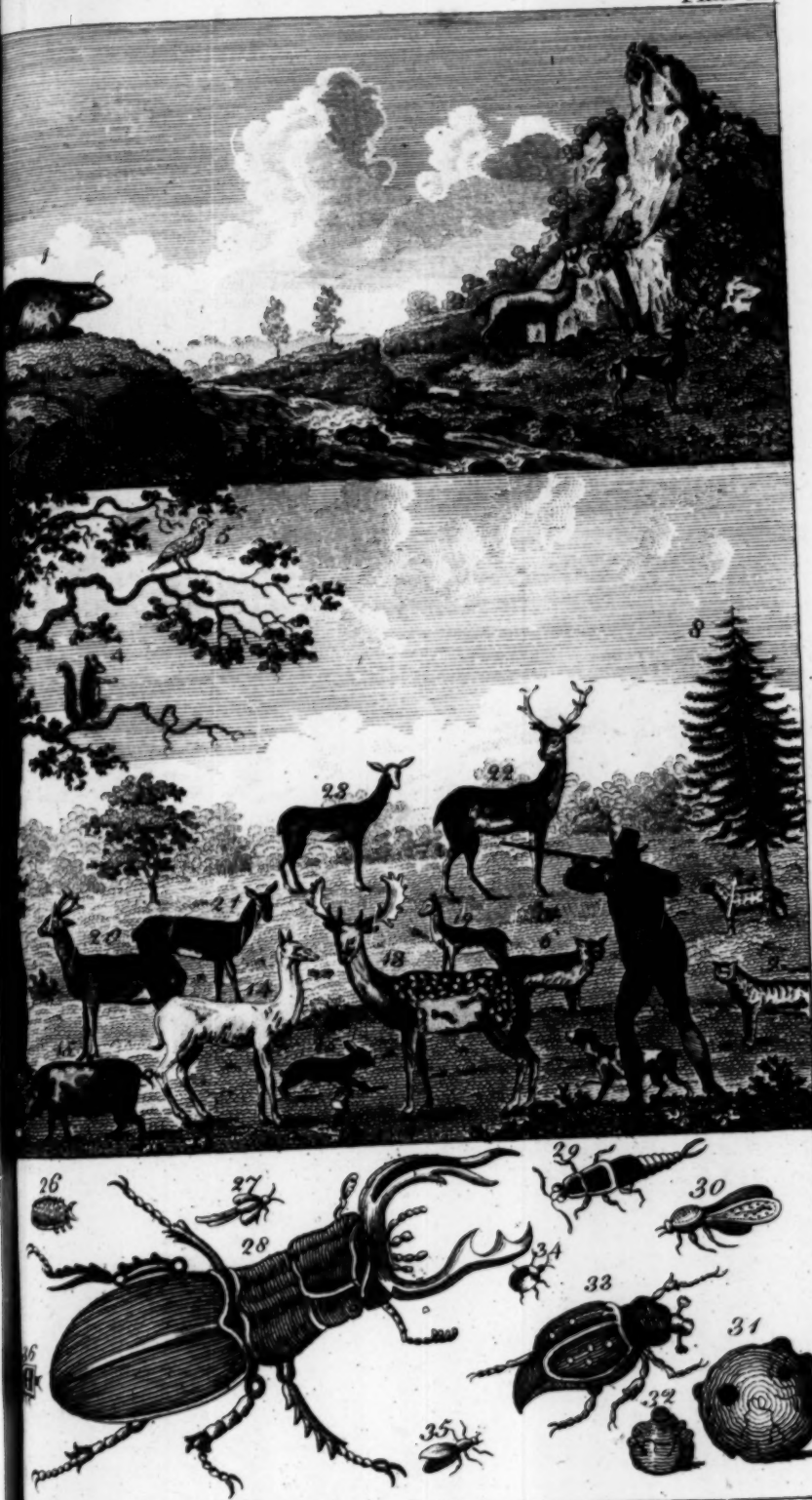














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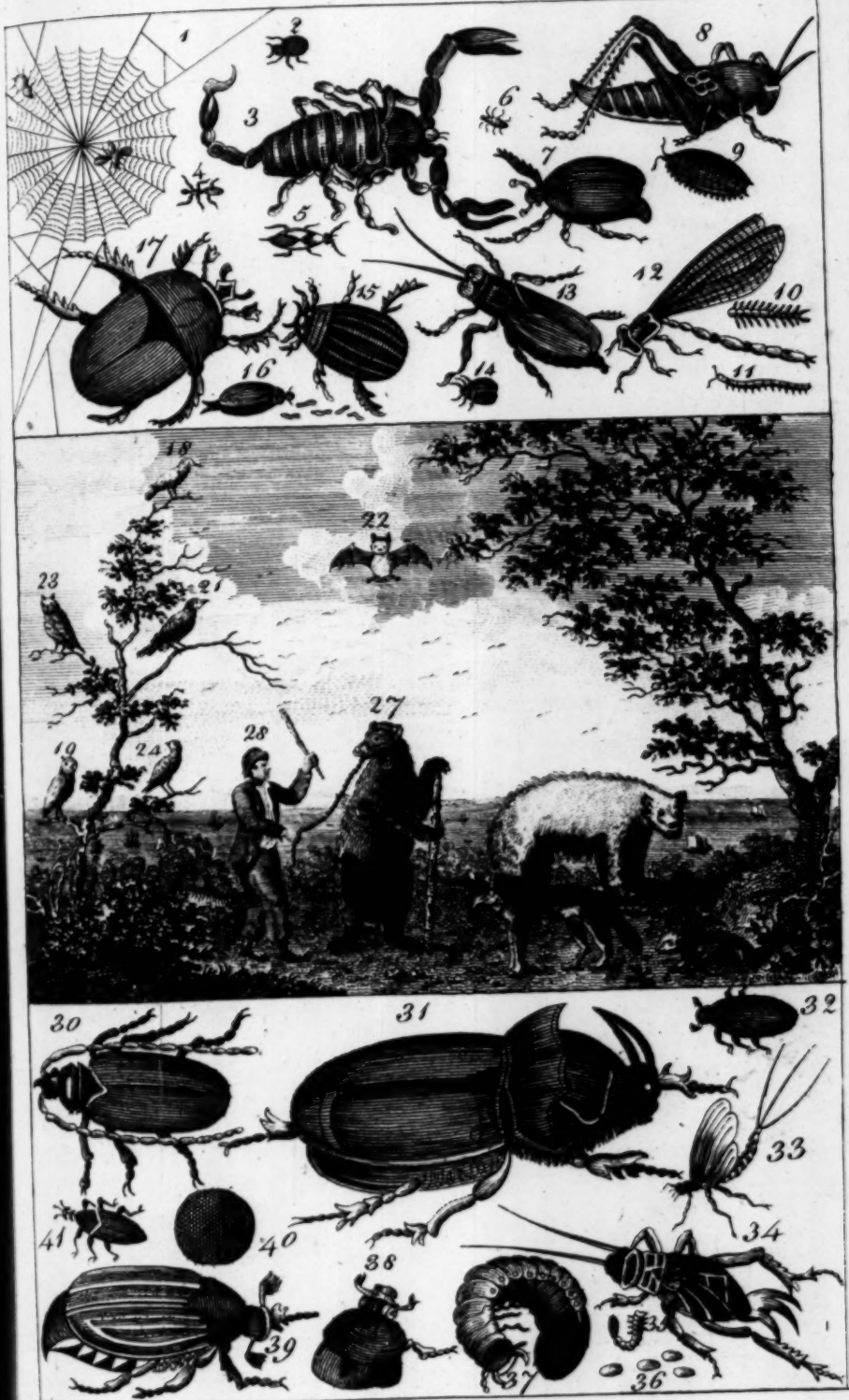


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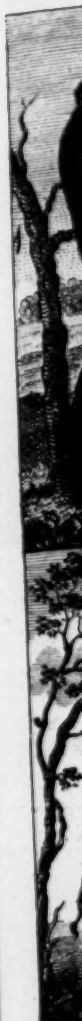
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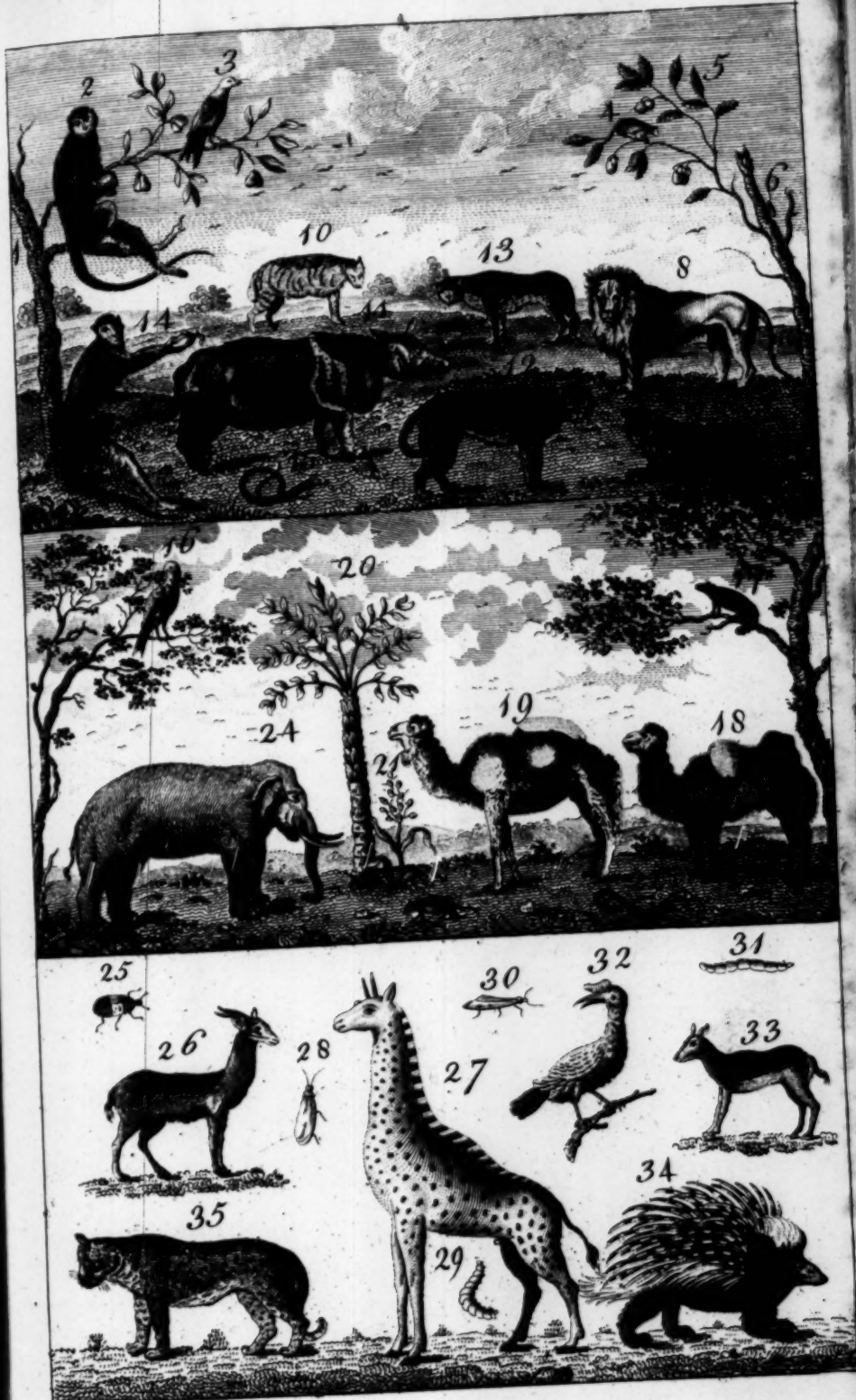




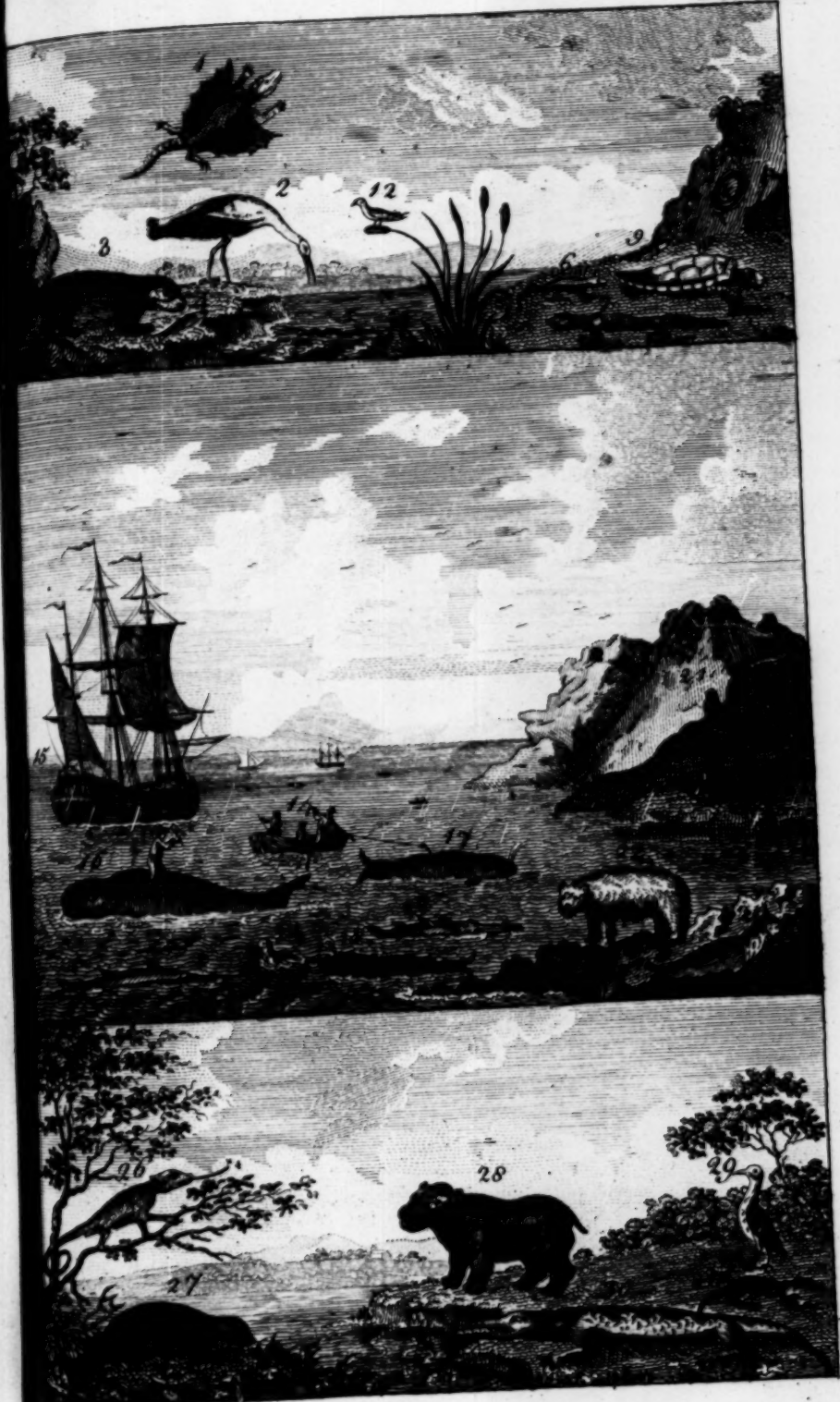














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